The Film Preservation Guide

The Basics for Archives, Libraries, and Museums

National Film Preservation Foundation
San Francisco, California

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Table of Contents

3. Film Handling and Inspection

4. The Curatorial Role

5. Duplication

PREFACE

This guide is designed to introduce film preservation to the community of research organizations that now have collections of motion picture film. It is a basic primer for film preservation "beginners"—professionals trained in archival studies, librarianship, museum work, or a subject field but unschooled in this technical specialty.

Film preservation is a relatively new activity for libraries, museums, and archives. For many years film was equated with the Hollywood feature and acquired by only a handful of organizations. In recent decades, however, scholars have come to value other types of films as historical and cultural records. A growing number of research institutions are opening their collections to regional documentaries, amateur films, newsreels, scientific footage, expeditionary documentation, political ads, educational and training films, and avant-garde works. The preservation literature has not kept pace with the expanding mix of film-collecting organizations.

In 2002, the National Film Preservation Foundation (NFPF) began talking with the Image Permanence Institute at the Rochester Institute of Technology and the L. Jeffrey Selznick School of Film Preservation at George Eastman House about what professionals needed to know in starting film preservation programs. The discussions broadened to include the Council on Library and Information Resources and several members of the Association of Moving Image Archivists' Regional Audio Visual Archives Group. All agreed on the importance of "demystifying" film preservation for individuals with curatorial duties involving film.

The group received a grant from The Andrew W. Mellon Foundation to develop two publications specifically for these professionals. *The Film Preservation Guide: The Basics for Archives, Libraries, and Museums*, prepared under the direction of the NFPF, aims at summarizing basic archival practices for handling, identifying, copying, storing, and making available motion pictures under conditions that extend their useful life. *IPI Media Storage Quick Reference* has a wider purpose. Designed for managers of multimedia collections that include film, *Media Storage* brings together information relevant to the preservation and storage of motion pictures, photographic prints, glass plates, ink-jet prints, audiotape, videotape, CDs, and DVDs.

We developed the two guides through an interactive process, involving users at key points. After sketching the preliminary plan for the publications, we held needs assessment workshops at Duke University and the Minnesota History Center of the Minnesota Historical Society. Attending were collection professionals from organizations in the early stages of developing local film preservation programs. At the two sessions attendees discussed what they desired to see in the publications

and helped formulate the approach for *The Film Preservation Guide*. Users asked for tools to guide decision making, for troubleshooting advice as well as step-by-step explications, and for case studies and "real-world" examples. Most important, they told us to avoid technical jargon and to provide a larger context for film preservation actions. We have tried to put these suggestions into practice.

As a second check and balance, both publications were reviewed by the students of the L. Jeffrey Selznick School of Film Preservation at George Eastman House. The students gave the publications a fresh eye and had many practical comments for improving their content and approach. Several helped the George Eastman House staff prepare the photo-illustrations for *The Film Preservation Guide*.

The guide went through another series of reviews. Each chapter was discussed and revised by the editorial committee. Then each was sent out to technical experts who checked through the text and made additional corrections. A number of institutions provided case studies and illustrations during this process. To complete the circle, volunteers from the needs assessment sessions then read through the working drafts and offered final suggestions. It is no exaggeration to say that the resulting publication represents the contribution of scores of individuals and institutions.

It is not surprising, given the diversity and range of the field, that experts disagreed on some emerging practices. Whenever approaches differed, we tried to choose those most appropriate for the intended users of the guide. Practices will improve in the years ahead. However, even as techniques change, they will remain rooted in the core curatorial principles followed by all archives, libraries, and museums.

Film preservation is an evolving field. This publication gathers together current information for nonspecialists working with film in regional archives, historical societies, libraries, and museums. It provides a starting point. We hope that *The Film Preservation Guide* will encourage new practitioners to join the film preservation community and take steps to save their institution's films.

Annette Melville, Director
National Film Preservation Foundation

Acknowledgments

This publication would not have been possible without the encouragement and support of The Andrew W. Mellon Foundation.

Scores of individuals generously contributed to *The Film Preservation Guide*. Heading the list is David Francis who, as a consultant, developed the technical framework and helped lead the discussion at the needs assessment workshops and the testing sessions at the L. Jeffrey Selznick School of Film Preservation at George Eastman House. Members of the editorial committee—Abby Smith (Council on Library and Information Resources), Karen Glynn (Duke University), Paolo Cherchi Usai and Caroline Yeager (George Eastman House), Jean-Louis Bigourdan (Image Permanence Institute, Rochester Institute of Technology), Bonnie Wilson (Minnesota Historical Society), Paul Eisloeffel (Nebraska State Historical Society), and Dwight Swanson (Northeast Historic Film)—were instrumental in seeing the project through, from start to finish. All deserve special thanks for tirelessly giving their time to make this guide a reality.

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How to Use This Guide

As mentioned in the preface, this publication was created through an interactive process that started with workshops. "Keep it simple!" was the mantra of these discussions.

Accordingly, *The Film Preservation Guide* attempts to cover a range of motion picture technical issues in relatively jargon-free language accessible to collection professionals without prior film preservation experience. Generally technical terms are defined the first time they are used and in the glossary as well. Whenever possible, technical information is summarized in charts or diagrams and presented so that it is easier to apply in decision making. Most chapters end with case studies providing examples from the field.

The arrangement of the chapters follows the path of film through the preservation process, from the first viewing by the subject specialist to the presentation of access copies to the public. The discussion focuses on collection activities that are distinct to film. Archives, libraries, and museums already have established practices for core functions such as cataloging; in these areas, the guide briefly highlights topics and issues particular to the moving image.

Motion pictures have been with us for more than a century—in a myriad of formats, venues, and uses. This guide does not attempt to address these many permutations. Instead it strives to describe motion picture preservation in terms of the materials and equipment most widely found in archives, libraries, and museums. It is intended as an introduction to the fundamentals of film preservation.

There are exceptions to almost every generalization. In seeking to provide a short, practical overview, most specialized techniques and formats are omitted. For more about these, see the selected bibliography.

1. Why Preserve Film?

America's film heritage is as diverse as America itself. For more than one hundred years Americans with movie cameras—professional and amateur alike—have traveled the country documenting traditions, telling stories, and recording events of the day. They have captured peoples and places not filmed by the mainstream media.[1]

Documentaries, newsreels, avant-garde and independent works, home movies, industrial films, political ads, scientific footage, anthropological records, travelogues, and fictional narratives—these works stand as the collective memory of the first century witnessed by the moving image. By saving and sharing these works, we can illuminate our common heritage with the power and immediacy unique to film.

For many years the value of these varied film types was not widely recognized. We associated filmmaking with Hollywood sound features and knew little about nontheatrical films held by museums, libraries, and archives. These one-of-a-kind works often lay untouched in the stacks or were simply too fragile to be shown to the public. Now, thanks to preservation work over the past two decades, these films are beginning to be seen. A more inclusive picture of national filmmaking is emerging to enrich our understanding of cultural history.

1.1 The Community of Film Archives

A few words on the changing nature of film archiving will help set the context for this publication. In the first decades of film preservation awareness, the priority was to salvage abandoned commercial releases from the early years of motion picture production. A small cadre of nonprofit and public institutions rose to the challenge. They developed techniques to duplicate decaying nitrate film onto safety film stock and showed the results at museum screenings and specialized festivals.

In 1938, these pioneers formed the International Federation of Film Archives (FIAF) to exchange information and promote standards for professional practice. By the late 1970s there were five large "nitrate" archives in the United States: George Eastman House, the Library of Congress, the Museum of Modern Art, the UCLA Film and Television Archive, and the National Archives and Records Administration (the official repository of U.S. government film production).

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1. This chapter is drawn largely from the following sources: *Film Preservation 1993: A Study of the Current State of American Film Preservation*, 3 vols. (Washington, D.C.: Library of Congress, 1993), also available at lcweb.loc.gov/film/study.html; *Redefining Film Preservation: A National Plan* (Washington, D.C.: Library of Congress, 1994), also available at lcweb.loc.gov/film/plan.html; National Film Preservation Foundation, *Report to the U.S. Congress* (San Francisco: National Film Preservation Foundation, 1997–2002); and *Treasures from American Film Archives: 50 Preserved Films* (San Francisco: National Film Preservation Foundation, 2000).

As the study of film has evolved beyond the Hollywood feature, so has the film archive community. *Film Preservation 1993*, published by the Library of Congress at the direction of the U.S. Congress, pointed to an increasing number of public and nonprofit organizations collecting motion pictures relating to a region, subject, or ethnic group. Since 1991, the Association of Moving Image Archivists (AMIA) has helped the film archiving movement to grow by providing a professional framework through which regional specialists could meet with their counterparts from the FIAF member archives and the Hollywood film industry. AMIA offers training, conferences, and opportunities for sharing information through its listserv and committees. Between 1993 and 2003, the association's membership quadrupled.[2]

Many more organizations, beyond those participating in AMIA, have moving image material of research value. Usually these motion pictures are part of audiovisual, digital, and paper-based special collections, personal papers, and record groups. In a survey of program participants completed in 2002, the National Film Preservation Foundation (NFPF) found that mixed-media collections are the rule rather than the exception among responding libraries, museums, archives, and historical societies.[3] In these institutions professionals do not specialize solely in film. Ninety percent of NFPF respondents reported that they were personally responsible for caring for materials in two or more media. More than half had curatorial duties involving film and at least three other types of materials.

Multimedia libraries, museums, and archives represent the most recent wave in the film preservation movement. As film gains recognition as documentation for research,[4] it is being collected and used by a broader range of institutions, and expanding the definition of the film archive.

1.2 Orphan Films

In film preservation, there is an informal division of labor between the public and private sectors. As demand has expanded for video, DVD, cable, and other ancillary markets, commercial film producers increasingly view their films as valuable corporate assets. The film industry now invests heavily in preservation and restoration activities. Today, when a public or nonprofit organization assists with the restoration of a commercially owned sound motion picture, it often works in partnership with the entity that owns the film. Generally the project has importance

2. AMIA grew out of two organizations devoted to the archival management of moving image material: the Film Archives Advisory Committee and the Television Archives Advisory Committee.

3. As reported in the findings of an unpublished 2002 survey of the NFPF's program participants, analyzed by Claire Nolan. The survey response rate was 93%.

4. See Stephen G. Nichols and Abby Smith, *The Evidence in Hand: Report of the Task Force on the Artifact in Library Collections* (Washington, D.C.: Council on Library and Information Resources, 2001), 35–38. Also available at www.clir.org/pubs/abstract/pub103abst.html.

for motion picture history, and the archive brings unique footage or special expertise to the collaboration.

Many films, however, fall outside the scope of commercial preservation programs. The Library of Congress's 1993 film preservation study drew attention to the preservation needs of these unprotected materials, often termed "orphan films." Orphan films lack either clear copyright holders or commercial potential to pay for their continued preservation. Generally the types of films most at risk are newsreels, regional documentaries, avant-garde and independent productions, silent-era films, amateur works, and scientific and anthropological footage. To a large degree, the preservation of orphan films has fallen to nonprofit and public organizations. Most federal grant funding for film preservation now targets orphan film materials that would be unlikely to survive without public support.

Given the expanding interests of contemporary scholarship and the growing appreciation of film as a cultural and historical document, orphan films have earned a place in the collections of libraries, museums, and archives. Like any research material, however, films vary in their quality, content, and value as historical records. Not every film can be saved through archiving and preservation. Some loss is inevitable. In a world of finite preservation resources, it is the responsibility of each institution to determine the parameters of its film collecting and manage materials so as to maximize long-term value for its constituencies.

This guide focuses primarily on films of historical and cultural interest and does not address the additional preservation issues of Hollywood sound features and works of art on film. It is designed to assist collection professionals in developing a phased approach to the preservation of film, one that recognizes priorities for preservation copying and integrates storage, conservation, duplication, and access into a broader plan for extending the useful life of film originals and their content. *The Film Preservation Guide* is a primer for those developing film preservation efforts at their institutions.

1.3 The Language of Film Preservation

In news stories on rereleased classic Hollywood features, the words "preserved" and "restored" sometimes appear to be used interchangeably. Before going further, it is important to define these terms in the context of public and nonprofit film collections.[5]

Preservation. For many years, in practice and in casual discussion, the term *preservation* was synonymous with *duplication*. When archivists inquired if a film had been "preserved," they generally were asking if it had been duplicated onto new and more stable film stock.

5. See Paolo Cherchi Usai, *Silent Cinema: An Introduction*, rev. ed. (London: BFI Publishing, 2000), 65–67.

Over the last decade, however, a broader definition of preservation has gained acceptance. Increasingly it is understood as the full continuum of activities necessary to protect the film and share the content with the public. Film preservation now embraces the concepts of film handling, duplication, storage, and access. These are the topics that will be covered in this guide.

Film preservation is not a onetime operation but an ongoing process. Even duplication must sometimes be repeated as techniques and standards improve. Like other museum objects and library materials, film needs continuing care to extend its useful life.

Conservation. Conservation is the protection of the original film artifact. Film has value as an object and as a carrier of information. Many organizations guard the original from unnecessary handling by creating surrogate copies to carry the content. The copies are used for exhibition and research. The film original can then be stored under conditions that slow physical decay.

Duplication. Duplication is the making of a surrogate copy. Preservationists consider film fully safeguarded only when it is both viewable in a form that faithfully replicates its visual and aural content and protected for the future by preservation masters from which subsequent viewing copies can be created. When making a preservation copy, preservationists generally try to work from the material that most closely represents the film as it was originally shown.

Restoration. Restoration goes beyond the physical copying of the surviving original materials and attempts to reconstruct a specific version of a film. Ideally this involves comparing all known surviving source materials, piecing together footage from these disparate sources into the order suggested by production records and exhibition history, and in some cases, enhancing image and sound to compensate for past damage. Film restoration, unlike art or paper restoration, always involves duplicating the original artifact.

Access. Access is the process through which film content is shared with the public. Depending on the institution, access embraces a range of activities, from support of on-site research to exhibition on the Internet. In museums, libraries, and archives, the most common access media at this time are film and video.

Case Study: Oklahoma Historical Society

This Is Our City **(1950, 600 ft., 35mm nitrate, black and white, sound), preserved by the Oklahoma Historical Society.**

With the passage of time, films can take on new meaning for the communities they depict. *This Is Our City*, a political ad preserved by the Oklahoma Historical Society, shows how a film can provide a window into history.

In the late 1940s, Oklahoma City leaders saw their growing community on the brink of a vast change. To move forward and continue to attract new business, the city needed to invest in streets, sanitation, flood control, an airport, libraries, and parks. Community leaders decided to put a bond issue to the voters in May 1950.

The chamber of commerce formed a committee to urge its passage and mounted a multimedia campaign embracing billboards, newspaper ads, radio spots, and speeches. Central to the effort was *This Is Our City*. The five-minute political ad appealed to civic pride and showed how the bond issue would improve life for the average family. In the last days before the election the ad was screened in movie theaters and meeting halls across the city. The $36 million measure passed overwhelmingly, with 80% voting yes.

The Oklahoma Metropolitan Library System, a beneficiary of the bond issue, saved a 35mm nitrate print of *This Is Our City* and donated it to the Oklahoma Historical Society. In 2001, the society received a preservation grant to copy the film on 35mm safety stock and make videotape copies for public access. Since then, the film has been exhibited by the Library of Congress at the Oklahoma venue of its national tour celebrating film preservation, excerpted for news segments and television programs, and even cited in a campaign for a new bond issue.

Many historical accounts, newspaper stories, pamphlets, and chamber of commerce records survive to tell the story of the election campaign and its importance to the development of Oklahoma City. More than do these paper records, *This Is Our City* captures the rhythms and feel of contemporary life. It seems to strip away the five decades separating us from this campaign and shows us how the issues were seen and understood by citizens in 1950.

2. Understanding Film and How It Decays

Since the 1890s, manufacturers have made countless varieties of motion picture stock to satisfy their many users. The first step in preserving film is understanding the shared traits of these materials and how their physical characteristics affect stability.[1]

2.1 Film Gauges

Film stock comes in different widths created for different markets. The width, generally called the gauge, is measured from edge to edge and expressed in millimeters —the most common in American collections being 35mm, 16mm, and 8mm.[2]

For each film gauge there is a family of like-gauged equipment and supplies designed to work together. Manufacturers make the film stock with holes (known as perforations), usually along the edges, to advance the film strip through the sprockets of same-gauged cameras and projectors.

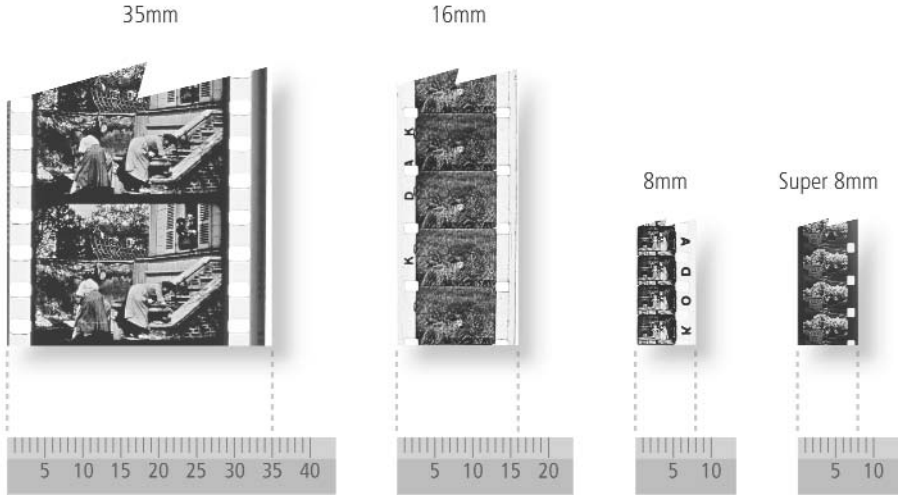
Smaller gauges are less expensive to use, making them more attractive for the amateur and educational markets. With larger gauges, however, the film frame has a greater area and projects a sharper image. This is why films created with the 70mm IMAX system appear so clear and crisp.

35mm. In 1893, the first commercially exhibited film in the United States used the 35mm gauge, and that remains the industry standard to this day.[3] As the new medium took hold, manufacturers improved camera and projection equipment, but for six decades they continued using flammable cellulose nitrate plastic (see 2.2) as a basic component of motion picture stock. The Eastman Kodak Company started phasing out cellulose nitrate film in 1948, and since the completion of the

1. Most of this chapter is drawn from the following sources: Steven Ascher and Edward Pincus, *The Filmmaker's Handbook: A Comprehensive Guide for the Digital Age*, rev. ed. (New York: Plume, 1999); Edward Blasko, Benjamin A. Luccitti, and Susan F. Morris, eds., *The Book of Film Care*, 2nd ed., Kodak Pub. H-23 (Rochester, NY: Eastman Kodak Company, 1992); Film Forever: The Home Film Preservation Guide, www.filmforever.org; Peter Z. Adelstein, *IPI Media Storage Quick Reference* (Rochester, NY: Image Permanence Institute, Rochester Institute of Technology, 2004); James M. Reilly, *Storage Guide for Color Photographic Materials: Caring for Color Slides, Prints, Negatives, and Movie Films* (Albany, NY: University of the State of New York, New York State Education Department, New York State Library, New York State Program for the Conservation and Preservation of Library Research Materials, 1998); and *IPI Storage Guide for Acetate Film: Instructions for Using the Wheel, Graphs, and Tables* (Rochester, NY: Image Permanence Institute, Rochester Institute of Technology, 1993).

2. *Film format* is a broader term that takes into account gauge; width, height, and position of the image; and sprocket hole size and placement.

3. Thomas Edison used strips of film 35mm wide for the kinetoscope, the personal film viewer that was unveiled in April 1893 at the Brooklyn Institute of Arts. The 35mm gauge was soon adapted for theatrical projection. See *Program Notes*, in *Treasures from American Film Archives: 50 Preserved Films* (San Francisco: National Film Preservation Foundation, 2000), 4.



Film comes in different widths, called gauges. The width is measured in millimeters.

changeover four years later, no nitrate film of any kind has been manufactured in the United States.[4] With minor exceptions, the expense and hazard of early 35mm limited the medium to professionals.

16MM. The film gauge most frequently found in American archives, libraries, and museums is 16mm. Kodak introduced 16mm in 1923 as a safe, nonflammable alternative for the home and educational markets. The cameras and projectors were portable, lightweight, and easy to operate. Amateurs embraced the new gauge and formed cine clubs where they could show their work and trade technical advice. Corporations adopted 16mm as a convenient gauge for employee training films. Soon an industry developed for producing 16mm instructional and educational films for businesses, schools, churches, and clubs. With the advent of portable video equipment in the 1970s, many 16mm users began switching to video. Thus, most 16mm films in archives, libraries, and museums date from the 1920s through the early 1980s.

REGULAR 8MM AND SUPER 8MM. Another common gauge in repositories is 8mm, often called Regular 8mm, which was introduced by Kodak in 1932 for home moviemakers. Many 8mm cameras use a spool or magazine containing 16mm film stock that is perforated with twice as many sprocket holes per foot as normal 16mm. When the film is sent to the laboratory for processing, it is slit to create two 8mm strips. Thus, 16mm and 8mm film have the same-size sprocket holes.

4. Most sources give 1951 as the last year of manufacture. Kodak reports that it began converting to safety film in 1948 and completely discontinued nitrate film production in 1952. Nitrate film stock remained in use through the early 1950s. Search "Chronology of Motion Picture Films—1940 to 1959," at www.kodak.com.

Super 8mm, first sold in 1965, brought an important innovation. It reduced the size of the sprocket holes, leaving more area for the picture. Super 8mm is used by amateurs and professionals and has won a following among avant-garde filmmakers.

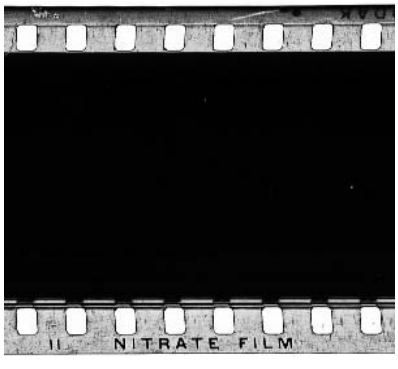
Other gauges. Many other gauges were tried in the early years of the nontheatrical market. Pathé, for example, introduced 28mm in 1912 and 9.5mm in 1922. Most did not survive the standardization brought largely by Kodak.[5]

2.2 Inside the Film Stock

Regardless of the gauge, all motion picture films have the same basic structure. Film stock has two primary layers. The thicker layer, the transparent plastic base, provides support. The thinner layer, the emulsion, carries photosensitive materials in a gelatin binder. Both the base and the emulsion are subject to decay.

Film bases. Over the years manufacturers have used three types of transparent plastic for the film base: first cellulose nitrate, then cellulose acetate, and most recently polyester. Each has its own characteristics.

Nitrate. When motion picture film was introduced in the 1890s, cellulose nitrate was the only available transparent plastic durable enough for movie cameras and projectors. While strong and flexible, nitrate base film has a singular downside: It is highly flammable. Nitrate fires are virtually impossible to extinguish once they start burning.[6] (See 6.5 on the procedures for storing nitrate film.)



The words NITRATE FILM appear along the edge of many Kodak cellulose nitrate motion picture stocks.

Most 35mm film stock before the early 1950s had a cellulose nitrate base. Because of its flammability, nitrate base film stock was never used by American manufacturers for 16mm and 8mm film and was not sold by Kodak to the home market. As a precaution, from the mid 1920s on, Kodak labeled many of its nitrate stocks with the words NITRATE FILM along the edge to distinguish it from the materials intended for hobbyists.

5. For a detailed chronology chart breaking out motion picture films by brand name, manufacturer, and film base, see *Film Gauges* in the glossary of the ScreenSound Australia Web site, www.screensound.gov.au. For more on antique gauges, see Paolo Cherchi Usai, *Silent Cinema: An Introduction*, rev. ed. (London: BFI Publishing, 2000), and Brian Coe, *The History of Movie Photography* (Westfield, NJ: Eastview Editions, 1981).
6. Once started, the combustion of nitrate film liberates its own oxygen and is self-sustaining.

TABLE 1. FILM GAUGES AND THEIR SUPPORT MATERIAL

Support	Dates of Use	Gauge
Nitrate	1893–early 1950s	35mm
Acetate	1909–present*	35mm, 28mm, 16mm, 9.5mm, Regular 8mm, Super 8mm
Polyester	Mid 1950s–present	35mm, 16mm, some Super 8mm

*Cellulose diacetate motion picture film is thought to have been introduced in 1909. The first extant example dates from 1912. Diacetate was followed in the 1930s by cellulose acetate propionate and cellulose acetate butyrate, and in the late 1940s by cellulose triacetate.

ACETATE. Manufacturers found a safe substitute for cellulose nitrate by exploring plastics in the cellulose acetate family. Beginning in 1909, a number of new acetate bases were introduced, starting with cellulose diacetate,[7] then in the 1930s cellulose acetate propionate and cellulose acetate butyrate, and finally in the late 1940s cellulose triacetate.[8] Generally speaking, all relatively nonflammable substitutes for nitrate are called safety film. Every known American 16mm and 8mm film employs some type of safety film base. Kodak acetate film often has the words SAFETY FILM printed along the edge.

POLYESTER. In the mid 1950s, Kodak began selling a new type of safety film made of polyester. Polyester is the toughest and most chemically stable film base used today. Because it is so strong, polyester can be made thinner than other types of motion picture stock. In addition, its tensile strength makes it less vulnerable to physical damage caused by improper handling. Polyester is the film stock now generally used for new 35mm release prints shown in American theaters. Unlike nitrate or acetate film, polyester cannot be spliced with currently available film cement. It can, however, be spliced with splicing tape or an ultrasonic splicer.

Under similar storage conditions, polyester far outlasts other types of film. Polyester is sold under various trade names, such as Cronar (Dupont) and ESTAR (Kodak).

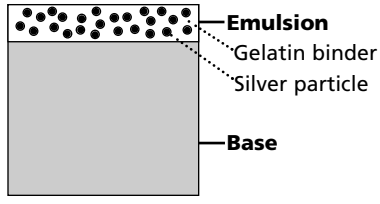
EMULSION. The emulsion carries the photosensitive materials in a gelatin binder, forming the image-creating layer. The composition of this layer differs for black-and-white and color films.

The emulsion of raw black-and-white motion picture film contains silver salts that are converted to metallic silver particles during processing. With black-and-

7. For a discussion of 28mm diacetate film, see Anke Mebold and Charles Tepperman, "Resurrecting the Lost History of 28mm Film in North America," *Film History* 15 (2003): 137–51.

8. Each brought a technical improvement: Cellulose acetate propionate and cellulose acetate butyrate overcame the physical weakness of cellulose diacetate but were not as strong as cellulose triacetate.

white stock, the emulsion side of the film appears duller and more textured than the shiny and smoother base side. When properly processed and stored, silver images are very stable.

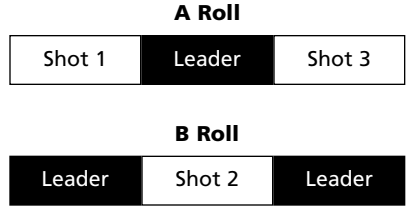


Cross section of black-and-white film.

The emulsion of color motion picture film, on the other hand, contains three layers of dyes—yellow, cyan, and magenta. The emulsion and base sides are difficult to distinguish, but it is possible to identify the emulsion side by holding the film to the light and checking for the side on which the image appears slightly raised or textured.

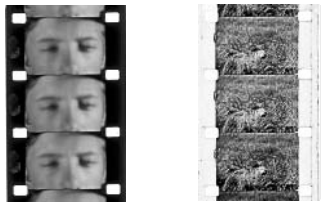
2.3 Negative, Print, and Reversal Films

In the photographic process that creates moving pictures, the film element that captures the image in the camera is the negative. The negative is developed and printed to make a positive for projection. Sometimes two rolls of negative or positive—A and B rolls—are run in succession through the printer, allowing the filmmaker to alternate between them to hide the splices between scenes and to create fades and dissolves. Where one carries the picture, the other has black or blank leader. Collections acquired from filmmakers and film-producing organizations may have 16mm negatives or positives in the form of A and B rolls.



With 16mm A and B rolls, the shots are divided between two rolls of film and separated by leader.

Reversal film is a special case. The same film that runs through the camera is processed to become a positive image. Thus, with reversal film, the camera original can become the projection print without use of an intervening negative.



In a reversal original (left), the film edge is black; in a print made from a negative, the edge is usually clear.

Often cost-conscious amateur and independent filmmakers favor reversal film. Because it shortcuts the traditional negative-positive printing process, reversal stock is cheaper to use. Reversal film may be color or black and white.

A good portion of the 16mm and virtually all Regular 8mm and Super 8mm prints

found in American collections are reversal originals. They can be identified by examining the film edge near the sprocket holes. If the edge appears clear, the print was produced from a negative; if black, it is probably reversal film.

2.4 Color in Film

While the first exhibited films were in black and white, filmmakers soon found ways to add color to their works. During the early years of the motion picture, color was sometimes painted on prints by hand, often with a stencil. The more common technique in the United States was to dye black-and-white prints with tints. Though tinting was largely confined to 35mm commercial releases, Kodak added amber and occasionally other colors to 16mm prints of theatrical films that were sold to consumers over-the-counter. These are found today in some collections.

Experiments in capturing natural color with the camera led to the development of various color film stocks and printing processes in the 1920s and 1930s for the lucrative 35mm commercial market. The remarkably stable Technicolor prints gained primacy in the late 1930s, but cheaper, more convenient systems eventually won out.

For amateurs, Kodak introduced the celebrated Kodachrome reversal film in 1935. While the film stock was initially prone to fading, Kodak made improvements and by 1938 had a film with notable stability. With 16mm and 8mm Kodachrome, color can remain vivid decades later, particularly if the film has been stored under cold and dry conditions.

After World War II, other brands of color film reached the 16mm and 8mm market, each with its own characteristics. Manufacturers have significantly improved the stability of photographic dyes, but fading is still a major preservation problem with older color films.

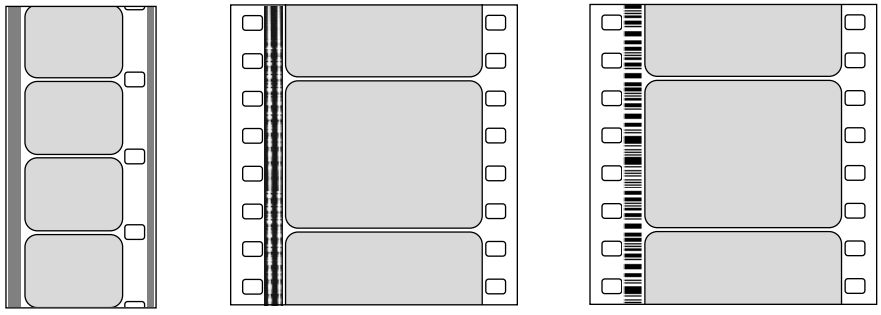
Lenticular film: black and white or "color"?

Before introducing Kodachrome, Kodak sold an unusual type of 16mm black-and-white film that projects as a color image when shown through a customized projector with a three-color lens. The film base is embossed lengthwise with ridges, called lenticules, that act as semicylindrical lenses. When light is projected through these lenticules and the three-color projector lens, a color image is created on the screen.

It is easy to mistake lenticular color film for black and white. For identification, first check for the word KODACOLOR printed on the film edge (see 3.3 on edge codes). Then examine the base side of the film under magnification, and look for raised cylindrical bands running parallel to the film edge.

Specialist laboratories can verify identification and make modern color copies from lenticular prints.*

*See the Film Technology Company Inc. Web site, www.filmtech.com.



Composite prints (from left): 16mm print with magnetic sound track and balance stripe, 35mm print with variable area optical sound track, and 35mm print with variable density optical sound track.

2.5 Sound Tracks

Early innovators strove to integrate sound, like color, in the motion picture viewing experience. Hollywood had converted to sound by 1929. The high-end amateur market followed, with RCA introducing the first 16mm sound camera in 1934. Sound tracks can be found on 35mm, 16mm, Super 8mm, and occasionally 8mm prints. A viewing positive with a sound track is called a composite print.

Before the advent of digital technology, sound tracks came in two types: optical and magnetic. Most optical tracks are photographically exposed directly onto the film during printing. In projection, light passing through the track is read and translated as sound. Optical tracks appear along the edge of the film as either high-contrast wavy lines (variable area) or a gray stripe of varying darkness (variable density).

Magnetic tracks, or mag tracks, work on a different principle from optical tracks. The mag track operates like a magnetic audiotape affixed to the film. During projection the track is read by the projector's playback head. Mag tracks appear as a dull brown stripe, usually along the edge of the film's base side. Particularly on small gauge films, a second stripe is often added along the opposite film edge for physical balance; with a stripe along both edges, the film produces a more even roll when wound. This balance stripe may be used to carry a second audio track.

Sound tracks usually precede their matching images on the motion picture film. This offset is necessary so that the projector reads the sound at a point in the film path at which the movement is smooth and steady.[9] The separation between sound and picture varies with format, as shown in table 2. It is important to remember this principle when making film repairs (see 3.5) so that sound is not lost.

In commercial filmmaking, before sound is added to the print it is often stored as a separate film element, tape, or electronic file. Collections acquired from film-

9. Film moves intermittently through the projection gate, where image projection occurs, so the sound track must be read either before or after the film passes through this gate.

TABLE 2. NUMBER OF FRAMES USUALLY SEPARATING SOUND AND IMAGE

	35mm*	16mm	8mm	Super 8mm
Magnetic track	28	28	56	18
Optical track	20	26	Not used	22

* 35mm mag and some early 35mm optical tracks follow the picture instead of preceding it.

makers and film-producing organizations may include 35mm or 16mm mag films used in production. These elements, sometimes called full-coat mags, have a dull-brown magnetic recording layer covering one side of the film surface. Similarly, filmmakers and preservationists may put the optical sound track on separate track-only reels.[10] With amateur and avant-garde films in particular, preservationists should watch for commentary, dialogue, or music recorded on a separate audiotape reel or cassette intended to be played with the film during screening.

2.6 COMMON TYPES OF DECAY AND DAMAGE

Early motion pictures were assumed to have little value after their initial commercial release. Film was intended as an exhibition medium.

While base and emulsion are both prone to chemical decay, some film stocks or batches may be more vulnerable than others. Poor storage and handling take a further toll. The following are common types of film decay and damage found in library, museum, and archive collections.

MECHANICAL DAMAGE. When film is mishandled, inevitably there is physical damage. Films unspooled on a dirty worktable or passed through worn rollers can pick up dust, dirt, scratches, and abrasions. Tears can occur if the film is stressed during winding (see 3.2) or projection. When the film is incorrectly threaded in the projector, perforations can be stretched, ripped, or torn apart. Improper shipping procedures are another major cause of damage (see 5.8). The physical evidence of past abuse remains with the film print.

Preservationists can repair tears, damaged splices, and broken sprocket holes. But scratches are permanent, though they sometimes can be minimized in the laboratory during duplication.

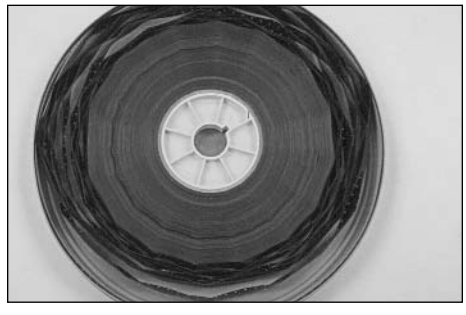
MOLD, MILDEW, AND FUNGUS. A film stored under humid conditions can become a host for mold, mildew, and fungus. Generally the organisms start the attack from the outside edge and make their way into the film roll. These biological agents can cause significant damage to the emulsion.

10. With optical track elements, the film area that would ordinarily carry the picture is blank.

The growth initially appears in the form of matte-white spots and eventually grows into a lacy, weblike pattern. The invasion can be stopped by cleaning the film (see 3.6) and then moving it to a cold and dry environment. Once the organisms have eaten into the emulsion, however, the image loss is irreversible.

Mold growing on film.

ACETATE DECAY (VINEGAR SYNDROME). Water, high humidity, and heat can destroy the plastic base of acetate film. In the early stage of decay the plastic releases acetic acid, which is chemically identical to vinegar, hence the name "vinegar syndrome." As the decomposition advances, the chemical reaction accelerates.



As acetate film decays, it shrinks, loses flexibility, curls, and warps.

Typically the decay process follows this pattern:

1. The film begins to smell like vinegar.
2. The film base begins to shrink. As the base shrinks irregularly, the film resists being laid flat. It curls and warps along both length and width.
3. The film loses flexibility.
4. The emulsion may crack and eventually flake off.
5. White powder may appear along the edges and surface of the film.

The acetic acid vapor released by films with vinegar syndrome can infect other acetate base materials stored nearby, particularly in a poorly ventilated storage area. The Image Permanence Institute (IPI) at the Rochester Institute of Technology advises freezing films in advanced acetate decay (A-D Strip level 2 or above).

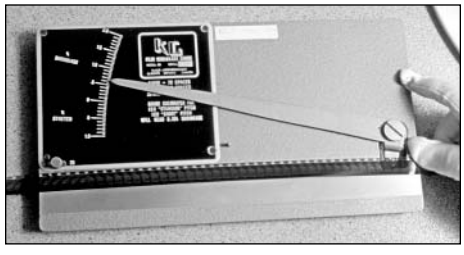
MEASURING ACETATE DECAY WITH A-D STRIPS

IPI's A-D Strips are an easy way to check for acetate decay. Just put a strip with the film in the can or box and close the lid. After at least 24 hours—exposure time varies with temperature and relative humidity—the strip will turn color on a scale from blue (0, the lowest acidity) to yellow (3, the highest). To assess the overall level of acetate decay in a film collection, IPI recommends testing a random sample of materials. Instructions are found in IPI's *User's Guide for A-D Strips*, which can be downloaded from www.rit.edu/ipi.

A-D Strips are not designed for use with nitrate or polyester film.

Acetate decay cannot be reversed, but it can be slowed by improving storage conditions (see chapter 6). At the early decay stages, the film content can be rescued by transferring it to new film stock. Generally once the film becomes too brittle, it cannot be copied in its entirety, although less damaged sections may be salvageable.

Shrinkage. Although shrinkage is a major symptom of acetate decay, it also affects nitrate and can be aggravated by overly dry storage conditions. If the relative humidity falls below 15% for extended periods, the film loses moisture, contracts, and may become brittle.



Using a shrinkage gauge.

Shrinkage is a particular problem for small gauge films because of the smaller size of the film frame and the mechanical precision required of the equipment. Once a 16mm or 8mm film has shrunk beyond 0.8% (1% for 35mm), it may be damaged in projection. Beyond 2%, even skilled laboratories can have trouble copying the film. At this point the film generally exhibits additional decay problems beyond shrinkage.

Color fading. While varying in stability, all types and brands of color motion picture film will fade over time. The three dye layers lose their original color at different rates. In some film stocks, yellow is the first to go; in others it is cyan. As dyes break down, the color balance changes. Contrast is lost, and the film begins

Using a shrinkage gauge

A shrinkage gauge is a tool for measuring the degree of shrinkage in motion picture film. As the film shrinks, the distance between its sprocket holes decreases correspondingly. The instrument applies this fact in measuring shrinkage.

To obtain a shrinkage reading, lay your film flat along the device and engage the sprocket holes in the two pins, one of which is fixed and the other movable. The instrument compares the standardized distance between perforations with that of your film and expresses the difference in terms of a percentage. Depending on the design, the tool can be adjusted to accommodate different film gauges. Illustrated instructions are provided on the Association of Moving Image Archivists (AMIA) Web site, www.amianet.org.

Recognizing the diagnostic importance of measuring shrinkage, the AMIA provides a shrinkage-gauge lending service for members.

Estimating shrinkage: the low-tech approach

While not as precise as a shrinkage gauge, another method for estimating shrinkage is to compare your film against new film stock of the same gauge.

Take a strip of fresh film 100 frames long and line it up with 100 frames of test film; if the older film is one-half a frame shorter, the shrinkage is 0.5%.

to acquire a pinkish brown cast. Eventually the film takes on a washed-out monochromatic look. Prints and negatives can experience fading at different rates.

Heat and high relative humidity are the main culprits in color fading. The process can be slowed by cool and dry storage (see chapter 6) but not reversed.

For many years motion picture laboratories have sought methods to correct faded Hollywood film. Recently several proprietary photochemical processes have attracted interest. Digital techniques are also gaining ground. But for the present both approaches are far beyond the budget of noncommercial film collections.

NITRATE DECAY. The best-known form of film deterioration is nitrate decay. Nitrate degradation is a chemical process that occurs because of two factors: the nature of cellulose nitrate plastic itself and the way that the film is stored.

Nitrate decay follows a pattern. The International Federation of Film Archives (FIAF) defines the telltale criteria that distinguish the five-stage process.[11] Generally once nitrate film reaches the third stage, it cannot be duplicated. Severely deteriorated nitrate film is a hazardous waste and should be transferred to an authorized facility for disposal.

Like other forms of chemical film decay, nitrate deterioration cannot be reversed but can be retarded by improving storage (see chapter 6). Nitrate film should be copied before degradation affects the image.

Nitrate "blooms" on a film in stage-two nitrate decay.

FIVE STAGES OF NITRATE DECAY

1. Image fading. Brownish discoloration of emulsion. Faint noxious odor.
2. Sticky emulsion. Faint noxious odor.
3. Emulsion softens and blisters with gas bubbles. More pungent odor.
4. Film congeals into a solid mass. Strong noxious odor.
5. Film disintegrates into brownish powder.

11. See Eileen Bowser and John Kuiper, eds., *A Handbook for Film Archives* (New York: Garland Publishing, 1991), 18–19.

MAGNETIC TRACK DETERIORATION. Preservationists have observed that acetate films with magnetic sound tracks are especially vulnerable to vinegar syndrome, leading scientists to speculate that the iron oxide in the magnetic track may act as a catalyst in acetate decay. As the film base shrinks and becomes brittle, it compromises support of the magnetic sound strip. The magnetic coating can shed oxide, become sticky, or completely separate from the base.

As with the other chemical decay problems, improved storage slows the process. To prevent sound loss, it is important to copy the sound as soon as decay is detected.

Table 3. Film Damage and Decay: Summary

Problem	Detection Method	Symptoms	Remedy
Mechanical damage *(All film gauges)*	Visual inspection	• Tears • Torn or broken perforations • Broken splices	Physical repair
Careless handling *(All film gauges)*	Visual inspection	• Dirt • Scratches and abrasions on the film surface	• Cleaning • Scratches can be minimized during preservation copying
Mold, mildew, and fungus *(All film gauges)*	Visual inspection	• Matte-white spots on exterior of film roll • Growth into lacy, white web	• Cleaning • Improved storage
Acetate decay *(All acetate base film)*	• A-D Strips • Smell • Shrinkage • Visual inspection	• Vinegar odor • Shrinkage • Loss of flexibility; curling • Cracked emulsion • White powder on edge • A-D Strip level greater than 0	• Slow by improving storage • Isolate infected films • Copy content before decay is too advanced
Color fading	Visual inspection	• Shift in color • Loss of contrast and color balance • Film appears washed out	• Slow by improving storage • Copy content before decay is too advanced
Nitrate decay *(Not relevant to acetate or polyester film)*	• Visual inspection • Smell • Rusty metal cans	1. Image fading. Brownish discoloration of emulsion. 2. Sticky emulsion. Faint noxious odor. 3. Emulsion softens and blisters with gas bubbles. Stronger odor. 4. Film congeals in solid mass. Strong noxious odor. 5. Film disintegrates into brownish powder. Extreme fire danger.	• Slow by improving storage • Copy content before decay is too advanced • Dispose films in advanced decay as hazardous waste
Decay of magnetic sound track on acetate film	• A-D Strips • Smell • Shrinkage • Visual inspection	• Film base loses flexibility • Mag track sheds, sticks, and separates • Vinegar odor • A-D Strip level greater than 0	• Slow by improving storage • Copy sound as soon as possible

3. Film Handling and Inspection

Film is fragile and vulnerable to the many types of damage and decay described in chapter 2. However, with careful handling and a few pieces of specialized equipment, preservationists can look at film safely and determine what further actions are needed to protect the material. This chapter outlines the steps for handling films during viewing and inspection. It also describes procedures for making simple repairs and cleaning film.[1]

3.1 Before You Start

Safe film handling requires specialized equipment and supplies. While several items are already part of the toolbox of library, archive, and museum professionals, others are specific to the motion picture. Film-handling equipment and supplies can be purchased from the vendors listed in appendix D. Institutions without these basics sometimes start by arranging to use equipment at a local film facility, perhaps a campus filmmaking department or a nearby film repository.

Manufacturers make film-handling equipment for every budget. Equipment can also be acquired secondhand. Many larger film and video supply houses offer refur-

Film measuring equipment (clockwise from left): 16mm footage counter, 35mm footage counter, marking pen, shrinkage gauge, loupe, and film rulers.

1. The primary published sources consulted for this chapter were Edward Blasko, Benjamin A. Luccitti, and Susan F. Morris, eds., *The Book of Film Care*, 2nd ed., Kodak Pub. H-23 (Rochester, NY: Eastman Kodak Company, 1992), and Film Forever: The Home Film Preservation Guide, www.filmforever.org.

Table 4. Equipping Your Film Collection

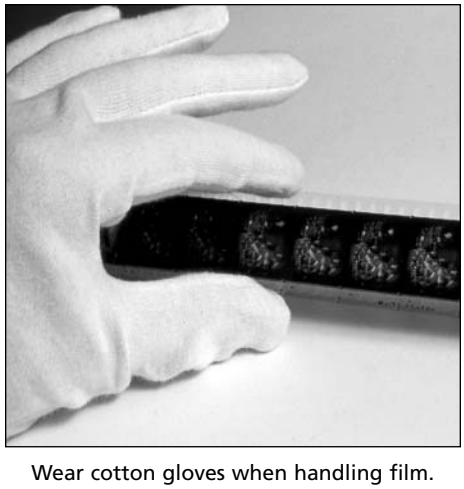
General archival supplies and tools

Cotton or static-free nylon gloves
Dust mask
Lint-free cloth and cotton swabs
Loupe
Permanent marking pen or Kohinor pen
Razor blades (single-edged) or X-acto knife
Safety glasses
Scissors

Specialized equipment and supplies

Film cement
Film cleaner and solvent-resistant gloves
Film containers*
Film cores*
Film leader*
Film reels*
Film ruler
Film viewer* or light box
Footage counter*
Perforated tape*
Presstape*
Rewinds*
Sound reader*
Splicer*
Splicing tape*
Split reel*

*Specific to film gauges in your collection

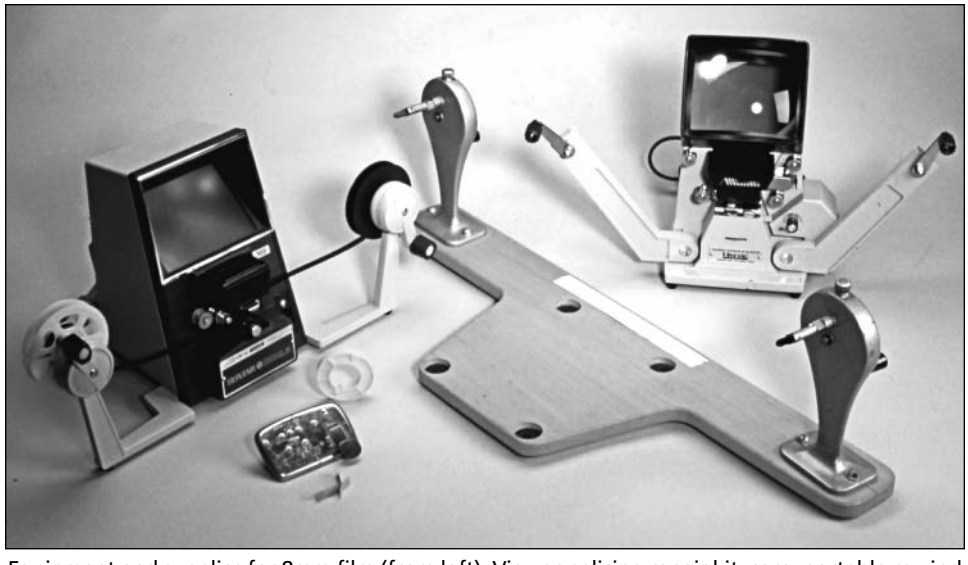


Wear cotton gloves when handling film.

bished equipment, such as portable rewind units, film and sound readers, and editing tables. Often vendors guarantee used equipment for several months. For small gauge viewers, splicers, and projectors, a number of preservationists have found bargains through nontraditional sources—online auctions, thrift stores, want ads, camera clubs, pawnshops, swap meets, garage sales, and Internet listservs for film hobbyists. If you acquire used equipment without a guarantee, be sure to have it examined carefully before purchase. Some camera shops will perform this service.

To view film safely without damaging the material, preservationists look at it with specialized equipment. Follow these general guidelines:

- Work on an uncluttered table in a well-lit and ventilated area.
- Before starting, clean the worktable. Film easily picks up dirt and dust.
- Wipe metal equipment with a cleaner that does not leave a residue. Rinse plastic tools and counters with distilled water.
- Wear cotton gloves when handling film. However, damaged perforations and splices may snag cotton fabric. If it becomes necessary to remove your gloves while handling damaged film, hold the film along the edges and never touch the sound track or image.
- Above all, resist the impulse to view your film with a projector. Projectors will inflict additional damage to films already weakened by shrinkage, tears, or decay.



Equipment and supplies for 8mm film (from left): Viewer, splicing repair kit, core, portable rewind bench, and viewer.

The following procedures assume the most basic setup—portable rewinds, split reels, and a light box with a magnifying loupe. Larger film repositories generally invest in more sophisticated equipment, such as tabletop film viewers, footage counters, or flatbed editing tables.[2] Most equipment can be purchased new or used. For a comparison of equipment by function and cost, see table 5.

3.2 Looking at Your Film

Step one: opening the film can. Film cans, the film's first line of defense, often bear the marks of past neglect. They can be rusted or dented shut. To open a damaged can, bang it gently on a hard surface (other than that of your clean worktable!). If this fails, as a last resort pry open the can with a screwdriver, being careful to prevent the blade from slipping into the can and damaging the film. When handling rusty cans, be sure to wear safety glasses and a mask for protection from fumes and flying particles.

Prints generally come to repositories on projection reels. However, production elements are often acquired on cores, plastic hubs around which film is wound for storage. Films on cores can be difficult to extract from the can, particularly if wound too loosely or packed too tightly into the can. In removing films from stubborn cans, support the roll with your hand or half of the split reel (see 3.4) so that it does not unspool when lifted. At this point, look for mold, mildew, and fungus and do a "smell check" for vinegar syndrome.

2. Some pieces of film equipment are often referred to by the name of the manufacturer. A film viewer may be called a Moviola and a flatbed editor called a Steenbeck or a Kem.

Use a screwdriver to open a difficult can.

When opening the can, tilt the lid away from your face to protect yourself from particles and fumes.

Remove the film roll from the can.

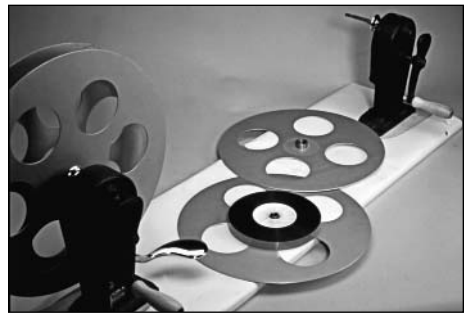
Brace the core with your hand to prevent it from popping out.

If you find mold, mildew, or fungus, you will need to clean the infected film. Dampen a lint-free cloth with film cleaner.

Then gently wipe mold from the film roll with the cloth. For more on cleaning, see 3.6.

STEP TWO: USING REWINDS. The rewind is a tool that enables the preservationist to unwind and wind film slowly without stressing the perforations. Rewinds are used in pairs—one for the feed and the other for the take-up. They can be operated left-to-right or right-to-left, depending on preference.[3] Rewinds come in portable units or editing table models. Motorized or hand cranked, they may also be fitted with long shafts, so that several reels can be examined side by side, and include accessories that control the film tension. Most preservationists recommend using manual rewinds for film inspection (see 3.3) and power rewinds for transferring film from reels to cores (see 3.4).

For examination on rewinds, films can be on either reels or cores. If your film is mounted on a core, you will need to use a split reel to put the film on the rewind. (A split reel consists of two flat discs that "split" apart to accommodate the core; see 3.4.) Let's assume the film is on a reel and has not been examined before. Mount the reel on the rewind, gently unwind some film, and thread the end on the take-up reel.



Portable rewind bench with a 16mm split reel and a film on a core.

STEP THREE: VIEWING. Sometimes film may exhibit a slight curl, and it may be necessary to let the film flatten out before viewing. Curl is generally caused by either low humidity (curl toward the emulsion) or extremely high humidity (curl away from the emulsion). If you let the film acclimate under more moderate relative humidity conditions (40% to 60% RH), it will usually flatten out. The key to quick acclimation is to expose as much surface area as possible.

The most basic way to examine a film is on the illuminated surface of a light box. Place the light box between the rewinds and pull the film gently down to the illuminated surface. Use the loupe to examine the film image. Crank the rewind slowly, stopping to sample images with

Cranking the rewind.

3. Some archives use horizontal rewinds instead of vertical ones. With horizontal rewinds, films can be wound on a core without the use of a split reel.

Viewing film on a light box with a loupe.

Viewing film with a tabletop viewer.

the loupe as you hold your gloved fingers along the film edges to keep the film frame flat on the box. Be particularly careful when winding prints with magnetic sound tracks. If the reel has been stored under damp conditions, the stripe can stick to the next layer and peel off. Also take care not to catch your gloves on broken perforations or splices. Film with extreme perforation damage may be handled without gloves.

A more convenient and efficient way to view film is with a tabletop film viewer. New 16mm models cost roughly $1,500, but the budget minded can often find secondhand viewers at a fraction of this price. To play the sound track of a composite print, you will need an additional piece of equipment, a tabletop sound reader. Flatbed editing tables can also play the sound track.

If the film may be of interest to your institution, it is worth investing time in a more thorough assessment—an inspection.[4]

3.3 Learning Through the Inspection Process

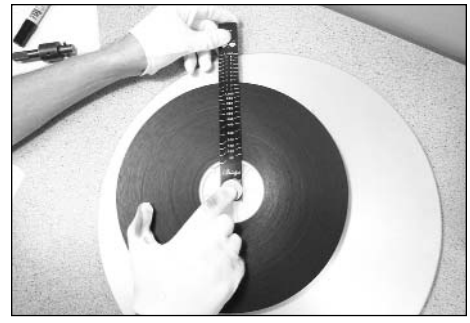
Inspection is the single most important way to date a film, identify its technical characteristics, and detect damage and decay. Much can be learned by examining your film carefully, from start to finish.

A standardized inspection work sheet (see appendix B) lists things to check and helps organize notes. This type of written report is the foundation for future preservation actions. Collecting the information during inspection will help you make informed decisions and enable you to document any changes in film condition over time.

Signs of decay and damage may vary across the length of the film. A footage counter provides a precise way of pinpointing the spots where problems occur as well as measuring film length. Without this instrument, you can roughly estimate

4. Many archives routinely examine films offered as gifts and use visual assessment to determine if the materials should be acquired.

film length using a film ruler. To make such an estimate, put the end of the film ruler on the center of the core. Then estimate the film's length by measuring the roll's radius. Usually the estimate is given in terms of number of feet. Split reels sometimes carry hatch marks that can be used for the same purpose.

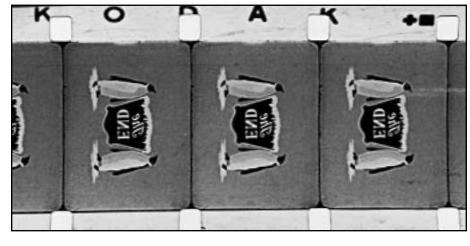


Using a film ruler.

During inspection you should also test older repairs. Remove any paper clips, tape, or paper affixed to the film,[5] and clean off the residue with a lint-free cloth dampened with film cleaner. Do not use film cleaner on magnetic sound film or films with magnetic sound stripes. As you wind the film slowly from feed to take-up reel, gently trail your gloved fingers along the edges to detect rough, torn, or poorly mended perforations. Assess the strength of each splice by gently twisting it in opposite directions. Also look for oozing adhesive that may have leaked from old repairs made with splicing tape.

Footage counter for 16mm film and loupe.

READING EDGE CODES. Film dating is facilitated by the manufacturing codes often printed along the film stock edge. Kodak employed a series of standardized symbols to indicate manufacturing year and, until the system was revamped in 1982, repeated the codes in 20-year cycles.[6] The same codes were used for 16mm and 35mm film.



The Kodak edge code ✚■ helps date this film as being from 1935 or soon after.

Let's suppose your 16mm film has the Kodak edge code ✚■. As shown in appendix A, Kodak manufactured films with this edge code in 1935, 1955, and 1975. Thus your film is likely to have been photographed during or directly after one of those years. A good detective can narrow the possibilities by looking for datable

5. Markers of this sort are commonly found during the first-time inspection of production elements acquired from filmmakers or filmmaking organizations.

6. For a discussion of date code symbols, search "H1 Film Identification" on the Kodak Web site, www.kodak.com. Kodak's 8mm film used different edge codes until 1965, when the symbols were standardized across all gauges. For 8mm edge codes, see the charts at Film Forever: The Home Film Preservation Guide, www.filmforever.org.

visual clues within the film itself, such as styles of dress, buildings, or automobiles. This is how the Alaska Film Archives at the University of Alaska Fairbanks established the date of the 1935 film discussed in the case study concluding chapter 4.

Film copies, however, may carry two or more edge codes, that of the original film stock as well as those of the generations printed from it. In this case the film is likely to have been shot between the first two dates. Edge codes are helpful clues but not the last word.

3.4 Replacing Old Film Reels and Containers

Inspection is the ideal time to replace rusty, dented, or chipped reels. Reels are designed to hold films for projection, not long-term storage. For 16mm and 35mm storage, the better choice is an inert plastic core measuring at least three inches in diameter. The core acts as a hub for the film roll. The larger the core, the wider the diameter of the film roll and the less stress on the film. Because of its small size, 8mm film is usually kept on reels. With reels as with cores, the larger the diameter of the hub, the less the film will be encouraged to curl.

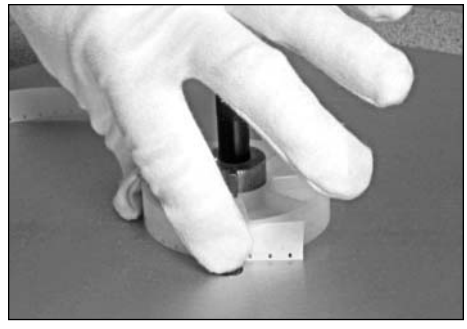
Split reels and cores. Films are transferred from reels to cores for storage (and back to reels for projection) using a split reel mounted on the vertical rewind. A split reel consists of two flat discs that "split" apart to accommodate the core. Providing support as the film is wound, the split reel may be mounted on either the feed or the take-up side.

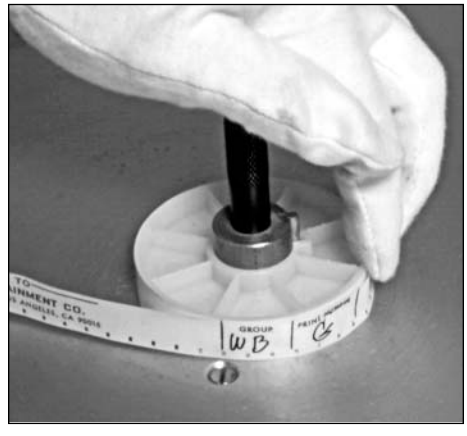
Questions to guide your inspection

1. How long is the film?
2. What is the gauge?
3. What is the film base?
4. Is the name of the manufacturer printed along the edge? Are there edge codes that might help with identification and dating?
5. Is the film color or black and white?* If color, does it display some degree of fading?
6. Is it silent or sound?
7. If sound, what type of sound track does it have?
8. Is it positive, negative, or reversal film?
9. Does it have a title or credits?
10. How much mechanical damage exists in terms of splices, scratches, and broken sprocket holes? How many feet from the start does the damage occur?
11. What is the degree of shrinkage as measured by a shrinkage gauge or by comparing to fresh film stock (see 2.6)?
12. Is there observable mold? Has the growth caused lasting damage?
13. Does the film smell of vinegar?
14. Are there other signs of decay or damage?

*Sometimes films include both black-and-white and color scenes that have been edited together.

To wind a film on a core, select the split reel and core that match the film gauge. Wind the film onto the core inside the open split reel, following the steps illustrated to the right. If the leader is too short or damaged, it might be necessary to replace it (see 3.5) so that there is enough to go around the core at least three times. Screw shut the split reel and mount it on the take-up side.





Starting the wind.

In transferring a film from a reel to a core, keep the film at an even tension. Be sure that the film edges stay aligned and that none protrude beyond the flat plane of the roll. A correctly coiled film roll should be wound tightly enough so that it looks like a solid disc. For storage, some repositories wind films tail out (with the beginning at the core), so that films will have to be rewound, and presumably reinspected, before they can be viewed from start to finish.

The edge of a poorly wound film is uneven and extends above the flat surface of the roll.

Like other library, archive, and museum materials, films generally come to repositories with acquisition information that provides clues to their origins and significance (see chapter 4). Over the years some materials inevitably straggle into repositories without contextual background. The original film container, leader, and reel may hold valuable evidence. Be sure to copy down any titles, dates, or production data found on these items and save notes housed in the can. The container's label itself may also carry information, but use it with caution. Cans frequently are reused or switched by accident. With new film acquisitions, preservationists generally try to replace damaged or dirty containers as soon as possible.

Labeling film. Before returning the inspected film to the shelf, check the label on the film leader. The leader protects the film and is the place to write unique identification data for the reel (for more on identification numbers see 7.2).

Leaders come in colors and are customized for different uses. Many preservationists recommend using new white leader or unprocessed black-and-white print stock. Some prefer using different color leader for the head and the tail. Whatever your choice, be sure that the leader provides a readable background for labeling.

For labeling film leader, most organizations stick to the basics, such as

- Short title or accession number
- Location code
- Reel number for a multi-reel work (for example, REEL 1 OF 2)
- Beginning (HEAD) or end (TAIL) of the reel of film

More information, of course, can be written on the film container (see 6.6).

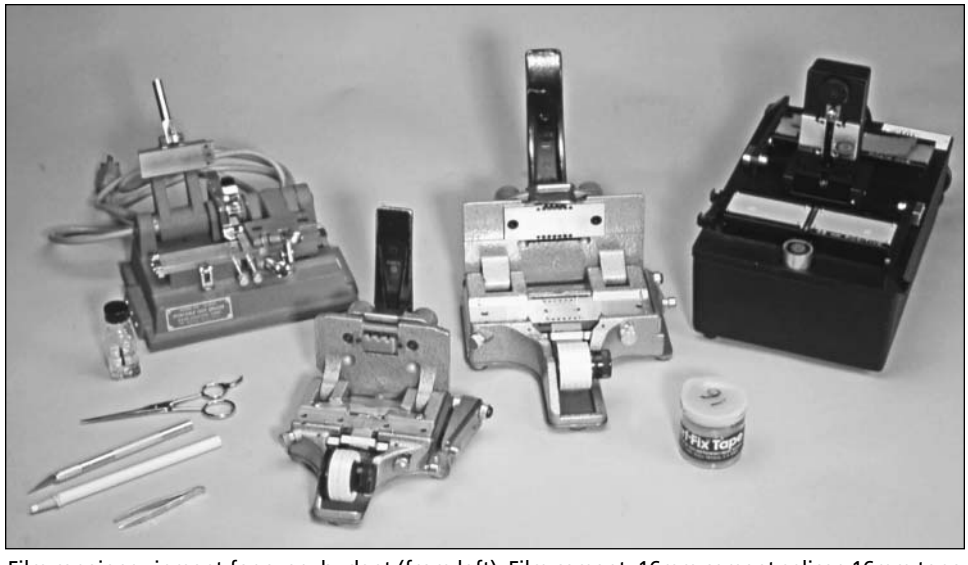
3.5 Repairing Film

It is important to repair film prior to its use on projectors, printers, and other sprocket-driven film equipment. Not every repository has the time, expertise, equipment, or need to make repairs in-house, particularly if it uses videotape or DVD for routine public service requests. Some beginners instead choose to pay commercial laboratories to do repairs, generally for a per-hour fee, as part of the preservation copying process (see chapter 5). Many cost-conscious preservationists take on simple tasks themselves for access copies but defer to laboratory technicians for repair of one-of-a-kind originals and preservation elements. If you are new to film preservation, it is recommended that you receive some hands-on training before undertaking film repairs.[7]

At many repositories, preservationists perform film inspection and repairs on a need-to-use basis. Films required for cataloging, research, loan, screenings, or preservation copying often go to the head of the queue. While films are generally repaired during inspection, tasks can be deferred until expertise is available. With accurate inspection reports serving as a road map, preservationists can return later to complete repairs or to assign them to a laboratory.

Making splices. Splices join together two separate pieces of film. The pieces are aligned and sealed using a piece of equipment called a splicer. Most noncommercial repositories make splices with either adhesive splicing tape or film cement. The tape method works for all film bases and is reversible. A primary drawback is that, as it ages, tape adhesive sometimes oozes from the seam, leaving a residue on the film surface. Tape splices can also be weakened by ultrasonic cleaning. The cement method results in a more permanent splice; however, the cements now on

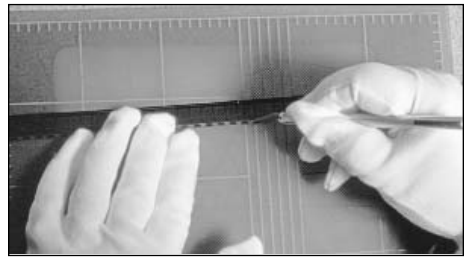
7. The Association of Moving Image Archivists, for example, generally provides training in conjunction with its annual conference. The Society of American Archivists offers a seminar in the preservation of audiovisual collections.



Film repair equipment for every budget (from left): Film cement, 16mm cement splicer, 16mm tape splicer, 35mm tape splicer, repair tape, and 16mm/35mm ultrasonic splicer. Also shown (bottom left): Scissors, X-acto knife, marker, and tweezers.

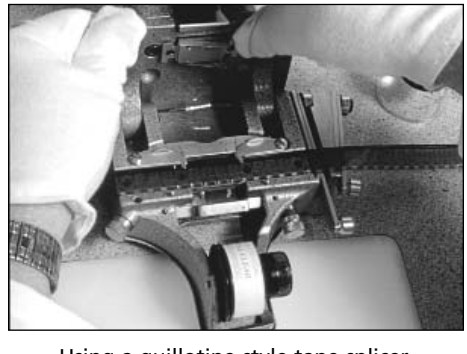
the market do not work with polyester film.

Weak or defective splices identified during inspection must be replaced before a film can be used on sprocket-driven equipment. To loosen the old splicing material, gently apply film cleaner with a lint-free cloth or cotton swab. A razor blade or other sharp tool can be helpful in removing tape. It is essential to remove all visible residue before continuing.



Removing old splicing tape by hand.

USING SPLICING TAPE. Depending on the design, tape splicers work with adhesive splicing tape or presstape. Some splicers employ pre-perforated tape, requiring the operator to cut the film ends precisely and carefully align the sprocket holes of the tape with those of the film. Guillotine-style splicers use unperforated tape into which they cut new sprocket holes. The least expensive splicers work

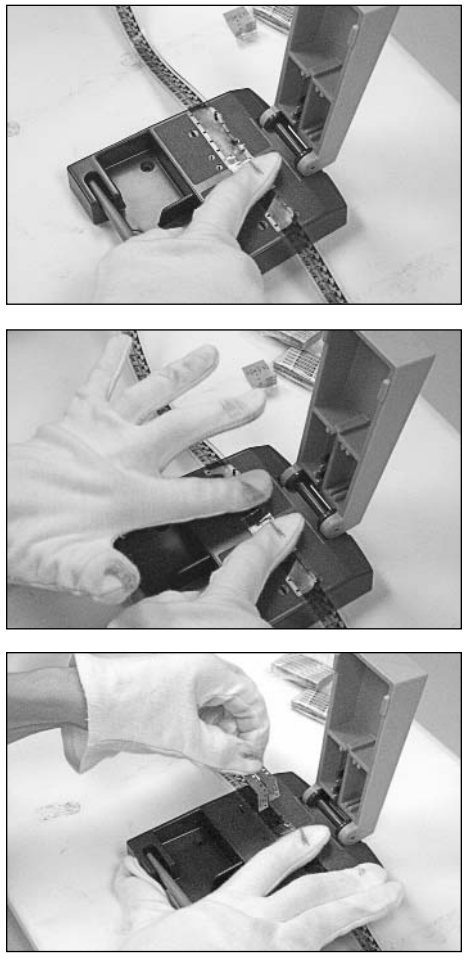


Using a guillotine-style tape splicer.

with presstape. Some more sophisticated models have both film and tape cutters built in.

Whatever the splicer design, tape splices require four basic steps:

1. Cut the two ends of the film, generally at the frame line, so that the newly cut edges are parallel. Wipe the ends with a lint-free cloth or swab dampened with film cleaner.
2. Place the two film pieces, ends touching, in the splicer, using the registration pins to align the sprocket holes.
3. Apply the splicing tape or presstape snuggly over the ends and pull down the splicer handle to apply pressure to the seal. For prints with magnetic sound tracks, be sure not to cover the magnetic stripe with tape.
4. Turn the film over, apply the tape on the other side of the splice, and complete the seal.



Making a splice using presstape.

Precut presstape works like a Band-Aid. The adhesive back is pulled off before pressure is applied to set the seal.

USING FILM CEMENT. In this type of splice, one film edge is cemented on top of the other, yielding a tiny repair that is almost double thickness. Cement splices are generally made with a special splicer, sometimes called a "hot splicer" when it includes a heater. Cement splices require more practice to execute than tape splices but tend to attract less dirt. They are also more intrusive, since layers of the film are removed to make the repair. Making a cement splice often requires the loss of one or more film frames. When using film cement, always work in a well-ventilated area.

Ultrasonic splicers

High-end ultrasonic splicers fuse film together without using splicing tape or cement and are used for splicing polyester film. New models cost several thousand dollars. *Never* use an ultrasonic splicer with nitrate film.

The basic steps for making a cement splice:

1. For the bottom half of the splice, carefully remove the film's emulsion from its base using a razor blade or the scraper built into the splicer. Some technicians also scrape the base on the top film as well.
2. For the top half of the splice, clean the underside of the film with a lint-free cloth or swab dampened with film cleaner.
3. Apply a small amount of cement to the prepared surface of the bottom film. Align the top and bottom films.
4. Push down the splicer handle, applying pressure to the seal for 10 to 15 seconds (longer if working in a cold room).
5. Wipe away any cement residue with a lint-free cloth.
6. Wait for the splice to dry (one minute or more) and then test it by giving a gentle twist.

Repairing perforations. Repairing torn or broken sprocket holes is a tedious but important task. Fortunately supply houses sell perforated tape for replacing sprocket holes on 16mm and 35mm film. Isolated breaks can also be fixed with splicing tape. Often for shrunken film, the perforations on the tape will not align with those on the film. For shrunken films slated for preservation copying, it is generally recommended that perforation repair be included as part of the laboratory job.[8]

Perforation damage to 8mm film can be repaired with presstape. Because of the small scale, 8mm and Super 8mm films are difficult to repair.

3.6 Cleaning Film

After inspection, the film can be cleaned to remove mold and projection oil. For this procedure you will need clean, solvent-resistant gloves (not the thin latex kinds used in medical exams) and a face mask. Be sure to work in a well-ventilated area, as mold spores can be harmful to your health. Another concern is the toxicity of the film cleaner. It is important to review the product specifications before use. As mentioned earlier, do not use film cleaner on magnetic sound film or films with magnetic sound stripes.

Mount the film on the rewinds. Sandwich the film between a folded lint-free cloth lightly dampened with film cleaner. Wind the film slowly, gently running it

8. It is possible to repair shrunken film by salvaging patches of film edge from discarded footage exhibiting a similar level of shrinkage. Splicing tape or cement can be used to affix the replacement edges to the damaged film. This is a difficult task and should be performed only by experienced technicians.

To clean mold from film, gently run the film through a cloth dampened with film cleaner.

through the cloth and allowing the liquid to evaporate from the surface before winding on the take-up reel. As the cloth accumulates dirt, fold it over to expose fresh fabric. Replace the cloth as needed.[9] Do not use this cleaning method on films with perforation damage.

It is important to clean a film before preservation copying. Commercial laboratories generally include cleaning, sometimes on ultrasonic equipment, as part of the preservation copying process.

3.7 Equipment for Every Budget

Table 5 compares film-handling equipment by cost and function. The basic supplies, such as safety glasses and cotton gloves, are constant across collections of every size and budget. The major difference is found in the equipment for viewing, measuring, and splicing film. The more expensive pieces generally have built-in features and are more convenient to use. Equipment can be acquired new or used.

Volunteers in the Film Archive

With training, volunteers and student interns can perform a number of routine film conservation and research tasks.* The assignments will vary with the volunteer's interests and skills. Volunteers with filmmaking experience can be an especially important asset.

Here are some tasks that can be performed by trained volunteers under the supervision of a preservationist.

- Measuring acetate decay with A-D Strips (see 2.6)
- Transferring film to cores (see 3.2 and 3.4)
- Cleaning access prints (see 3.6)
- Packaging film for frozen storage (see 6.2)
- Preparing shot lists as supplement to catalog record (see 7.2)
- Performing research on events and people shown in films (see 4.2)

*For more on volunteers, see Laura Daly, *Establishing a Volunteer Program: A Case Study*, Technical Leaflet 170 (American Association for State and Local History, 1990), originally published in *History News* 45 (January/February 1990), and Mary Ellen Conaway, *Student Projects and Internships in a Museum Setting*, Technical Leaflet 184 (American Association for State and Local History, 1993), originally published in *History News* 48 (March/April 1993).

9. Some archives buy rolls of disposable cotton towels for this task.

Table 5. Film Equipment by Function: Safe Handling Tools for Every Budget

Function	Basic Budget	Mid-Level Budget	High-End Budget
Replacing containers	• Film cans or boxes • Marking pen and labeling tools • Gloves, safety glasses, lint-free cloth, and other basic supplies	• Film cans or boxes • Marking pen and labeling tools • Gloves, safety glasses, lint-free cloth, and other basic supplies	• Film cans or boxes • Marking pen and labeling tools • Gloves, safety glasses, lint-free cloth, and other basic supplies
Transferring from reel to core	• Vertical rewinds, hand operated • Split reel and regular film reels • Cores of inert plastic • Gloves, safety glasses, lint-free cloth, and other basic supplies • Film cleaner and solvent-resistant gloves	• Portable rewind unit, hand cranked, with built-in light well • Split reel and regular film reels • Cores of inert plastic • Gloves, safety glasses, lint-free cloth, and other basic supplies • Film cleaner and solvent-resistant gloves	• Editorial or comparison table with power rewinds, light well, and other built-in equipment • Split reel and regular film reels • Cores of inert plastic • Gloves, safety glasses, lint-free cloth, and other basic supplies • Film cleaner and solvent-resistant gloves
Viewing	*The above items plus:* • Light box, portable • Loupe	*The above items plus:* • Tabletop film viewers for gauges in collection • Tabletop sound reader	*The above items plus:* • Portable rewind unit, hand cranked, with built-in light well • Tabletop film viewers for gauges in collection • Tabletop sound reader
Inspecting for damage and collecting technical data	*The above items plus:* • Film ruler	*The above items plus:* • Footage counter	*The above items plus:* • Footage counter built into workstation
Making repairs and replacing leader	*The above items plus:* • Perforated tape • Razor blade and scissors • Film leader • Simple splicer • Presstape	*The above items plus:* • Perforated tape • Razor blade and scissors • Film leader • More sophisticated splicer, with compatible splicing tape and film cement as appropriate	*The above items plus:* • Perforated tape • Razor blade and scissors • Film leader • For polyester film, ultrasonic splicer; for acetate film, sophisticated splicer (with built-in features), with compatible splicing tape and film cement as appropriate

4. The Curatorial Role

The inspection process yields an array of technical data as well as physical clues to a film's date and past use, but how do the bits of evidence add up? What do the details tell about the film's original purpose and reception? Does the film provide a window into subjects, cultures, and historical periods documented by your institution? How does the film contribute to your collection?[1]

This chapter discusses additional types of information, beyond the physical evidence in the film itself (discussed in chapter 3), that help in identifying motion pictures and evaluating their historical and cultural importance. From these sources the subject specialist builds an understanding of the film's significance. The last piece in the puzzle is the assessment of uniqueness—whether the film represents the best surviving source material on which to base future preservation copies.

4.1 The Paper Trail

Usually the first step in contextualizing your film takes you to materials within your own institution.

Institutional records. Virtually every library, archive, and museum now keeps records on materials accessioned into its collections. Depending on local practices, these files may include correspondence with donors or sellers, appraisals, inventories, published brochures or articles, and curatorial notes. The information may also vary with the age of the record. At the very least the records give the acquisition particulars and mention colleagues—both active and retired—who were involved in the transmittal.

Preservationists should not forget the artifact itself. Often the cans, labels, and notes stored in the original film container contain useful documentation. (For more on this type of evidence, see 3.3.)

Films in multimedia collections. For films acquired as part of collections of personal papers or organizational records, your institution may have rich documentation buried in the collection itself. Correspondence and diaries may illuminate how and why amateur films were made—either through specific reference to their creation or by amplification of events depicted in them. For films that are part of

1. The primary published source consulted for this chapter was Stephen G. Nichols and Abby Smith, *The Evidence in Hand: Report of the Task Force on the Artifact in Library Collections* (Washington, D.C.: Council on Library and Information Resources, 2001), particularly "The Artifact in Question," 8–16. Also available at www.clir.org/pubs/abstract/pub103abst.html.

organizational records or archival record groups, there is sometimes even more contextual material—scripts, in-house newsletters, memos, photographs, artwork, financial records, and distribution logs. Records from film-producing organizations can be a treasure trove.

ORAL HISTORY. For newer accessions, past owners or their heirs are often the best resource. A telephone call or e-mail message may stimulate discussion or result in an invitation. For visits and interviews, some specialists recommend bringing a videotape copy and encouraging the contact to identify people and places. The interviewee may also share photographs or other artifacts. Every interview has the potential to point to other useful sources.

4.2 PUBLISHED SOURCES

Learning more about your motion picture may also require library research. Books, articles, and Web sites about the filmmaker and the depicted subjects, events, and places can provide outside validation of your film's significance as a historical document. The bond issue promoted by *This Is Your City* (the political ad profiled in the case study in chapter 1) was covered in detail in Oklahoma City newspapers and chamber of commerce records. Contemporary accounts suggest how the film fit within the overall campaign.

Publicly exhibited motion pictures are often discussed in published reviews or articles. Cinema historians have long combed the American entertainment trade papers for reviews of silent-era fiction films. In addition to their critique, these pieces often include credits, original running time, and production information. Regionally produced and exhibited films had their own media following. *Kearney and Its People in Motion Pictures*, the 1926 portrait of a Nebraska railway town held by the Nebraska State Historical Society, was described with pride in Kearney's *Daily Hub* twice during the year of production.

Political ads, industrial films, public service announcements, educational documentaries—any published film targeting a specific audience may be covered in publications read by those viewers or issued by the group making the film. Trade journals such as *Business Screen Magazine* and *Educational Screen* are excellent resources for information on defunct production companies and are full of leads to individuals who may have participated in the making of films. Reference books like *Educational Film Guide* (no longer published) contain credits, synopses, and other information on a surprising variety of nontheatrical titles.[2]

It also may be useful to consult the records of the U.S. Copyright Office at the Library of Congress. Many commercial releases, from Hollywood features to edu-

2. *Business Screen Magazine* appears to have begun in the 1940s and continued publication for several decades. *Educational Screen* was a monthly published between 1922 and 1956. *Educational Film Guide* was issued irregularly by the H.W. Wilson Company from 1936 to 1962.

cational films, were registered for protection under federal copyright law. With the application, claimants sometimes included scripts, scenarios, and other production materials. These files are available through the Motion Picture, Broadcasting, and Recorded Sound Division and accessed by the registration numbers listed in the published copyright catalogs.

4.3 Recognizing Value in the Commonplace

Films capturing a different voice or point of view can have significance that transcends their simple origins. They may document communities not usually depicted in the mainstream media or show traditions or events that only a participant could film.[3]

This is why some amateur films can be such telling historical documents. Rev. Sensho Sasaki, for example, filmed everyday activities in the West Coast Japanese American communities in the late 1920s and early 1930s. These are ordinary enough home movies, but history has a way of adding value to the commonplace. Today it is not possible to view Sasaki's films, now in the collection of the Japanese American National Museum, without seeing them as a time capsule of communities soon to be uprooted by forced incarceration during World War II.[4]

For the subject specialist, it can be challenging to identify the culturally significant among the many home movies and television news films offered to regional collections. In the end, the specialist makes the assessment by factoring in institutional collecting interests as well as the film's age, technical quality, subject matter, and point of view.

It is important to articulate these collecting interests in a written acquisitions policy. Most repositories already have written policy statements defining the subject areas, geographic regions, and time periods in which they acquire materials. These documents link acquisitions to institutional mission and clarify collecting goals across various departments. Be sure film is included in these documents. This will both acknowledge its role and help guide future selection decisions.

4.4 Does Your Institution Have the "Best" Surviving Source Material?

Once the historical value of your film is established, the last piece in the puzzle is the assessment of uniqueness. With this question, the discussion moves from your institution to the national and international perspective.

3. For more on the significance of home movies, see Patricia R. Zimmermann, *Reel Families: A Social History of Amateur Film* (Bloomington, IN: Indiana University Press, 1995).
4. See *Program Notes,* in *Treasures from American Film Archives: 50 Preserved Films* (San Francisco: National Film Preservation Foundation, 2000), 77.

Motion pictures, by their very nature, may exist in multiple prints and negatives. Other museums, archives, and libraries may own copies, as might collectors and commercial archives. How can you tell if your institution's material is the "best" and worth using in future preservation work?

As with so many curatorial matters, this determination is based more on judgment than on formula. Among the factors to consider are (1) number of copies known to exist in other collections, (2) number of generations of your film from the camera original, (3) completeness of your copy (gauged by accounts of the film's original length), and (4) its physical condition.

With films acquired directly from professional filmmakers or filmmaking organizations, this is generally an easy call. A and B rolls, magnetic sound tracks, and negatives are elements used in film production. Unless damaged or incomplete, these sources are the most authoritative records. Motion pictures received directly from an amateur filmmaker or the filmmaker's heirs are also likely to be "best" copies.

Another fairly straightforward case is the 8mm, Super 8mm, and 16mm reversal original. These films are unique objects.[5] Artist films with color or scratching added by hand present a similar situation.

Things become less clear-cut, however, with prints. As a rule of thumb, the smaller and more specialized the film's target audience, the fewer the number of prints that were made. With fewer prints, the likelihood is greater that your institution has research materials not duplicated elsewhere. But subject matter, source, and common sense also come into play.

Take, for example, 8mm or 16mm sound copies of Hollywood cartoons, shorts, and features. These prints were mass-produced for home and institutional markets, and it is highly probable that commercial collections own better-quality 35mm copies of most titles.[6] For silent-era films, however, the equation changes. With some 75% of American silent feature production thought to be lost, a vintage reduction print could be a valuable source. For such prints, it is worth calling an archive specializing in silent film or checking the silent film database of the International Federation of Film Archives (FIAF).[7]

For motion pictures created for a specialized audience and not widely circulated, the research can be accomplished in several steps. A few strategic calls or visits to organizations collecting in the subject area or affiliated with the filmmaker can

5. In some cases, particularly in that of avant-garde films originally created on reversal stock, duplicate copies were later printed on reversal stock. Often duplicates have two sets of edge codes—one for the original and the other for the copy.
6. One area of exception can be low-budget or independent films, particularly ones from companies that have gone out of business. In some cases 16mm sound copies are all that survive of B-Westerns or films made for African American audiences.
7. This is published as part of the annually updated *FIAF International FilmArchive Database* and is available on CD-ROM from Ovid (formerly SilverPlatter), www.ovid.com. As of 2003, FIAF's silent film database included records for 37,000 titles.

verify if other copies are thought to exist. Searching for a better copy of its 16mm *Airplanes at Play*, made by the young Charles Stark Draper in the early 1930s to raise seed money for aeronautical research, the MIT Museum located 35mm source material at the celebrated engineer's own laboratory.

Government-made films are a special case. Because the National Archives and Records Administration (NARA) retains copies of federally produced films, it is probable that prints in nonfederal collections replicate materials already in NARA custody. Many state and local governments also produce films, but archiving practices vary with jurisdiction. Research on prints of state and local government productions generally requires more legwork.

Nationally distributed 16mm industrial films, educational documentaries, public service announcements, and training films are the most difficult to research. Hundreds of prints may have been created for schools, military bases, businesses, clubs, and churches. Yet for some titles few copies may survive. It requires a good deal of research to find out if you have the best surviving print of a 16mm industrial or educational film.

When checking for other copies, there are many paths to explore. Often the best place to begin is the online catalog of the Library of Congress, which includes records for much of the Library's motion picture holdings. Another useful Internet source is the Prelinger Archives, which provides access to viewable copies of almost 2,000 advertising, educational, and industrial films.[8] Also worth checking are the bibliographic utilities OCLC and RLIN for the film records contributed by universities, archives, and museums (see 7.4). Lastly, there is *Footage*, an international directory describing 1,860 collections of moving image materials in North America alone.[9] Designed for stock footage researchers, this reference work covers many little-known repositories and includes an extensive subject index through which you can identify organizations likely to hold similar materials.

Preservationists are increasingly turning to colleagues for help through professional listservs. The Association of Moving Image Archivists (AMIA), the American Library Association, and the Society of American Archivists (SAA) host community discussion groups through which professionals can post queries and receive responses from the field.[10] Specialized subject listservs are also a resource.

8. Accessible at www.archive.org/movies. Founded by Rick Prelinger, the Prelinger Archives includes more than 48,000 advertising, educational, industrial, and amateur films. It was acquired in 2002 by the Library of Congress.

9. The directory includes 3,000 collections from around the world. See *Footage: The Worldwide Moving Image Sourcebook* (New York: Second Line Search, 1997).

10. Information on film and archival practices is regularly exchanged on AMIA-L: An Online Forum for Moving Image Archivists, www.amianet.org/amial/amial.html; the H-Film Discussion Group, www.h-net.org/~film; the SAA Archives and Archivists Listserv, www.archivists.org/listservs/index.asp#archives-archivists; and the SAA Visual Materials Section's Cataloging and Access Roundtable List, www.lib.lsu.edu/SAA/vmelist.html.

For some types of films, however, even extensive searching in national databases and calls to colleagues will not yield a definitive answer, and the specialist can never be 100% sure that a print represents the best surviving source material. Thus for the film-to-film preservation described in chapter 5, preservationists recommend putting at the head of the queue items known to be unique, rare, and historically significant.

TABLE 6. ASSESSING THE UNIQUENESS OF FILM MATERIALS: SUMMARY

Film Material or Type	Does Your Institution Have the "Best" Surviving Source Material?
Production element (A and B rolls, interpositive,* negative, or magnetic track)	Probably yes, if materials are complete and in good physical condition.
Reversal original	Probably yes, if materials are complete and in good physical condition.
Hand-colored artist print	Probably yes, although similar copies may exist.
Amateur film or home movie	Probably yes, if material is reversal original. If a print, check institutional records and contact filmmaker or heirs.
Reduction print** of Hollywood feature or short	If 8mm, no. If 16mm sound print, probably not. If 28mm or 16mm print of a silent film, perhaps. More research required.
Print of federal government film	Probably not.
Print of film produced by state or local government	Perhaps. Likelihood increases if 35mm print. More research required.
Print of specialized-subject film with limited circulation	Perhaps. Likelihood increases if 35mm print. More research required.
Print of regionally produced film with limited distribution	Perhaps. Likelihood increases if 35mm print. More research required.
Print of nationally distributed educational or industrial film	Unlikely. Difficult to document. More research required.

*An interpositive is a color production or preservation element made from a negative original and then used to create a duplicate negative from which many prints can be generated. An interpositive is not intended for projection.

**A reduction print is a positive made in a smaller format than the original.

Case Study: University of Alaska Fairbanks

***Will Rogers and Wiley Post* (1935, 650 ft., 16mm, black and white, silent), preserved by the Alaska Film Archives, University of Alaska Fairbanks.**

Celebrated humorist Will Rogers on August 15, 1935, shortly before his air crash.

In identifying film there is no substitute for a good curatorial eye. The story of how the Alaska Film Archives unraveled the mystery of two unidentified films transferred from the Fairbanks North Star Borough Library is a case in point.

Usually archives rely on accession records to establish a film's source and history. For this acquisition, however, the university had little information. All that was known was that the two films had been held by the public library and had survived two floods. This was borne out by the condition of the cans, which were rusted and had to be pried apart. Inside were 16mm reversal originals tightly wound on their original reels. Before starting inspection, the curator let the films acclimate and carefully rewound them onto larger-diameter cores, adding new leader at the head and tail.

A good deal can be learned about a film by examining it closely. The first clue is the code on the edge of the film stock, which tells where and when the film was manufactured. Checking the edge code against a Kodak chart (see appendix A) established that the film was shot in 1935 or after. The condition of the reversal print was the next bit of evidence. The original was battered—broken perforations, bad splices, and abrasions—and appeared to have been frequently projected. What could have so interested audiences? Before putting the film on a viewer, however, the curator checked shrinkage with a homemade measuring tool. The shrinkage appeared slightly under 1% and within the tolerance of the equipment.

Little did the curator expect to find among the images humorist Will Rogers visiting with friends at the Pacific Alaska Airways hangar at Weeks Field in Fairbanks. Piecing together the edge code date, film condition, locations shown in the shots, and other visual evidence, the curator determined that he was examining the last known moving images of Rogers and his friend Wiley Post before the air crash that took their lives on August 15, 1935.

The university received a grant to preserve the film and make VHS tape copies available to the public. This historically important footage is now safely housed in the archive's film vault at 40°F and 35% relative humidity. The reference copies are indexed in the Goldmine catalog of the University of Alaska Fairbanks, Elmer E. Rasmuson Library, which can be accessed on the Web at www.uaf.edu/library.

5. Duplication

To protect the film original and the information it carries, preservationists copy the content and use the new duplicates for public service. For historically and culturally significant titles, repositories invest in film-to-film duplication, creating a new viewing print, access copies, and masters that will safeguard the film for years to come. Short of this optimum long-term preservation solution, repositories can buy precious time for their films by making inexpensive video copies for service and putting the originals in cold storage. Cold and dry storage slows deterioration and permits preservation copying to be prioritized and spread over many years. However, video, while convenient and cost-effective, does not provide a lasting preservation medium.

Most libraries, museums, and archives contract with specialist film laboratories to make preservation and access copies. (For definitions see 1.3.) A basic understanding of the preservation copying process will help you manage projects. This chapter describes both the duplication process and the collaboration between the preservationist and the laboratory.[1]

5.1 Before You Start: First Do No Harm

In the conservation and restoration of any artifact or museum object, preservationists abide by the physician's oath: First do no harm. Film preservation is no different. Whatever effort is invested to save a film, the actions should not damage the original. The original should emerge intact and whole at the end of the process. As doctors reject killing the patient to cure the disease, so preservationists should avoid sacrificing the artifact to save the content. Of course, there are cases when the original is so damaged that it cannot be retained, but these are the exception.

From this first conservation principle follows a corollary: Measures taken to save artifacts and museum objects should be reversible and well documented. Film preservation again follows these basic tenets. If source material is reordered during the duplication, most preservationists insist that the changes be made in such a way that they can be undone if necessary. Furthermore preservationists document the process so that their successors will know exactly what steps were taken.[2]

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1. The primary published sources for this chapter are *ACVL Handbook: Recommended Practices for Motion Picture and Video Laboratory Services*, 5th ed. (Hollywood, CA: Association of Cinema and Video Laboratories, n.d.) and *Film Preservation 1993: A Study of the Current State of American Film Preservation*, 3 vols. (Washington, D.C.: Library of Congress, 1993), also available at lcweb.loc.gov/film/study.html.

2. For more on the professional ethics of film preservation and restoration, see Paolo Cherchi Usai, *Silent Cinema: An Introduction*, rev. ed. (London: BFI Publishing, 2000), 44–76, and the *FIAF Code of Ethics*, available online at www.fiafnet.org/uk/members/ethics.cfm.

Preservationists also have a responsibility to the public. Film audiences and scholars will experience the original through the copy created by duplication and restoration. If parts of the film are modern reconstructions, viewers deserve to know. In restoring the short films of the Edison Company, produced nearly two decades before the ascendancy of the sound film, the Museum of Modern Art worked from the company's written records to reconstruct the long-missing intertitles, the screens of text that explain the action to the viewer. The museum developed intertitles that were so similar to the Edison Company's typographical style that they were virtually indistinguishable from the originals. The museum added a small MoMA logo to each new frame to acknowledge the reconstructions.

5.2 Protecting the Original

Long-term protection: copying film on film. Film preservation is an investment in the future. Ideally, it involves creating both a surrogate for public use and one or more masters through which new copies can be made without returning to the source. The masters can take different forms—negative/positive, optical/magnetic, analog/digital—depending on the format, characteristics, and generation of the film original.

Protecting the original by creating new film masters is the gold standard in film preservation, but the process is time-consuming, exacting, and expensive. In 2003, creating a new negative and print of a 1,000-foot 16mm black-and-white silent positive cost between $1,550 and $2,800.[3] Because of the cost, this process may only be feasible at present for films of singular research value that are thought to represent the best surviving copy (see 4.4).

The preservation masters guarantee that film content is safeguarded and that the original will be shielded from unnecessary handling.[4] If a viewing copy is damaged, a new one can be made from the preservation elements without subjecting the source to additional wear and tear. Once duplicated on film, the original can be returned to cold storage.

Short of film-to-film duplication, there are significant steps that repositories can take to make the film accessible as part of their conservation strategy. These involve making video access copies and using cold storage strategically to buy time for the film original (see 6.1).

Access copies. Before video became commonplace, many films in research institutions were unviewable. Video brought a public service revolution and made it

3. Based on estimates received with National Film Preservation Foundation (NFPF) grant applications in 2003 for film source materials in relatively good physical condition. Color is generally more expensive; the creation of a new internegative and print for a 1,000-foot 16mm print is estimated to cost between $1,800 and $4,300.

4. When resources are available, preservationists may make two masters—one that is used to generate new prints and a second that is held in reserve as a safeguard.

possible to provide moving image access with off-the-shelf consumer electronics equipment. A number of repositories now routinely copy new acquisitions onto analog VHS videotape, making copies either in-house or by arrangement with a commercial facility.[5] For reference service, organizations are also increasingly relying on video copies of works protected through film-to-film duplication. The new film prints can then be reserved for screenings and exhibition loans (see 9.2, 9.5).

Thus video has given preservationists an additional tool for assessing a film's research value: actual research use. Works that are frequently consulted on video clearly have research value. Demand, along with the other factors discussed in chapter 4, should also be considered when prioritizing films for full film-to-film preservation.

Analog videotape. Analog video is a flexible and inexpensive access tool. Although the image and audio quality is relatively low, analog video carries information sufficient for most research requests. Additionally, VHS is playable on equipment already installed in most institutions. It is convenient, portable, and easy to use. VHS videotape serves as a stand-in for the original, which can be retired to safekeeping in cold storage. Under most conditions, analog videotape retains an acceptable signal for 20 to 30 years, although poor handling, dirty equipment, and heat and humidity will, of course, shorten its life span.[6]

Digital videotape. Given the fragility of VHS cassettes, and the near-obsolescence of three-quarter-inch U-matic video equipment, some organizations take the extra precaution of creating the first video copy on better-quality videotape. This video master is then used to generate VHS copies for years to come. For more than a decade the video format of choice was BetaCam SP, the half-inch analog tape that gained acceptance in the television industry in the 1980s. With the increasing popularity of digital tape, some organizations have switched to half-inch Digital Betacam tape (also known as Digi Beta or DBC), which is now preferred for broadcast. Recording image and sound digitally, Digital Betacam can be replicated without significant loss and provides a more robust platform than analog tape for making subsequent copies on DVD and other digital media.

Digital frontier. The growing use of digital records leads to the question: Why bother with duplicating film on film at all? Why make a new film master photochemically when it is possible to convert film content directly to digital files?

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5. Some organizations make low-cost VHS copies in-house on a film-video converter, sometimes known by the brand name Elmo (see 9.1), which operates like a camera hooked up to a film viewer. These VHS video copies are of lower quality than those produced by telecine equipment. Damage can occur to the original during transfer, and it is important to repair breaks and tears prior to the operation. Fragile, shrunken films should not be transferred with a film-video converter.

6. See Steven Davidson, "Videotape Issues and Concerns," in *The Administration of Television Newsfilm and Videotape Collections: A Curatorial Manual*, ed. Steven Davidson and Gregory Lukow (Los Angeles: American Film Institute; Miami: Louis Wolfson II Media History Center, 1997), 121–122. For a fuller discussion of videotape longevity, see *Television and Video Preservation 1997: A Report on the Current State of American Television and Video Preservation*, 4 vols. (Washington, D.C.: Library of Congress, 1997), 18–27, also available at lcweb.loc.gov/film/tvstudy.html. For a primer on video preservation, see the interactive DVD *Playback: Preserving Analog Video* (San Francisco: Bay Area Video Coalition, 2003).

In part the answer is another question: Does current digital technology capture the audio and image information of the original without loss? At present the answer is no. Scanning at sufficient resolutions to capture all the image and sound content of film is still in the testing stage. In the future it may become possible to scan the original and capture the inherent data at an affordable cost, but it is not yet clear which approaches will have long-term archival value.[7]

In this age of electronic initiatives, preservationists in both the private and public sectors feel growing pressure to "digitize" their holdings. Digitization, however, is not yet a practical film preservation solution. The best way to protect film content for the future is still the time-honored approach of copying film onto film and storing it in a cold, dry vault. At present film remains its own unrivaled long-term preservation medium.

Developing a long-term preservation strategy. Selecting titles for film-to-film duplication can seem a daunting decision. The preservationist weighs many factors, including the film's historical significance and uniqueness as well as research demand, availability of funding, and institutional priorities. In developing a long-range film preservation plan (see 6.8), the benefits brought by cold storage must be included in the equation. Storage is covered in more detail in the next chapter but is worth discussing here as a critical factor in decision making.

For film, cold and dry storage conditions are the equivalent of preventive medicine.[8] Good storage slows decay and extends the useful life of the original. When motion pictures last longer, title-by-title duplication can be planned in phases over many years and not driven by emergency. Proper storage buys precious time.

Budget-conscious preservationists are coming to view film-to-film duplication as the way to protect the most important research materials—the gems of the collection. They are turning to video as a convenient, cost-effective means of providing access and protecting the original from handling. Without storing the original and masters under cold and dry conditions, however, duplication and access-through-video offer few long-term benefits for film survival. Cold and dry storage is the single most important factor in extending the life of film. It provides the framework for preservation planning and scheduling duplication over time.

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7. Even with such developments on the horizon, preservationists will still face the central challenge of digitization. No matter how faithful the digital copy, it must be refreshed and reconfigured for use with changing access systems. Thus the cost of a digital copy will include not just its creation but its repeated copying and ongoing maintenance. For more on digital archiving, see *Building a National Strategy for Preservation: Issues in Digital Media Archiving* (Washington, D.C.: Council on Library and Information Resources, 2002), also available at www.clir.org/pubs/abstract/pub106abst.html, and *The State of Digital Preservation: An International Perspective* (Washington, D.C.: Council on Library and Information Resources, 2002), also available at www.clir.org/pubs/abstract/pub107abst.html. For an overview of digital preservation issues, see Margaret MacLean and Ben H. Davis, eds., *Time & Bits: Managing Digital Continuity* (Los Angeles: J. Paul Getty Trust, 1998).
8. See "Keeping Cool and Dry: A New Emphasis in Film Preservation," in *Redefining Film Preservation: A National Plan* (Washington, D.C.: Library of Congress, 1994), 33–38. Also available at lcweb.loc.gov/film/storage.html.

TABLE 7. DUPLICATING YOUR FILM: OPTIONS AND TRADE-OFFS

Duplication Approach	Benefits	Limitations
Film, along with film print and VHS tape or DVD access copy	• Long-term protection of original. Masters can last for years if properly stored. The new master is used when new copies are required. The access copy shields the original, which can be left undisturbed in cold and dry storage. • Print available for screenings and public service. • With good-quality preservation work, print quality replicates the sound and visual quality of the original. • Film playback equipment relatively unchanged over time. • Proven preservation medium that has industry standards. • New print can be copied on video for access.	• Most expensive. • Film projection and viewing equipment required for public access to film print. Projectors must be either rented or maintained in-house and regularly serviced. Flatbed editing tables are more expensive than VHS videotape players.
VHS tape copy only	• Most inexpensive to make. • Convenient to use. • Playback equipment available in most institutions. • Serves as surrogate for the original, which can be left undisturbed in cold and dry storage.	• Poorer image and sound quality than film. • Inadequate for broadcast or reuse in film production. • Shorter life span than film. • New video copy from film will have to be made within two to three decades. • Playback equipment likely to become obsolete.
Betacam SP tape, along with VHS tape copy for routine access	• Serves as surrogate for the original, which can be left undisturbed in cold and dry storage. • Provides better-quality video master than VHS for creating subsequent copies. • Adequate for broadcast.	• More expensive than VHS. • Shorter life span than film. • New video copy from film will have to be made within two to three decades. • Betacam SP in declining commercial use. • Playback equipment likely to become obsolete.
Digital Betacam tape, along with VHS or DVD copy for routine access	• Serves as surrogate for the original, which can be left undisturbed in cold and dry storage. • Provides better-quality video master than analog videotape for creating subsequent copies. • Digital Betacam tape now in widespread commercial use. • Adequate for broadcast. • Serves as platform for other digital output media, such as DVD.	• More expensive than VHS. • Shorter life span than film. • Digital records will need to be refreshed and reformatted over time. • Playback equipment likely to become obsolete.

5.3 Film Preservation Laboratories

With few exceptions, public and nonprofit archives contract with commercial film laboratories for preservation copying. The duplication of older film differs substantially from the mass production of theatrical release prints, and over the last few decades several dozen American labs have moved into this specialty. Specialists work on a smaller scale and tailor their approach to the project at hand. Some have developed areas of particular skill—8mm or Super 8mm, color, nitrate film, or sound. Given the fragility of older film and the range of its decay problems, preservation copying is a craft for experts.

Specialist laboratory work is priced by the labor and time required for the task. The cost for even a standard product such as a black-and-white silent negative varies with film condition, amount of preparation work, location of the lab, and other factors. With more complex jobs, the expense increases. Costs vary within a range and cannot be reduced to a uniform price-per-foot figure. These variables —products (see 5.4), processes (see 5.5), and costs (see 5.7)—make it all the more important for preservationists to understand the basics before undertaking a project.

5.4 Products Created Through the Duplication Process

Film-to-film duplication can produce a bewildering array of preservation masters and access copies. The masters vary with the type of source material and the level of protection needed for the original. As a rule of thumb, the more exacting and complicated the project, the more intermediate materials and testing copies required. The accompanying chart begins with four types of source materials found in cultural repositories—the silent print, the sound print, the silent negative, and positive A and B rolls with separate magnetic track—and shows the products created in the duplication chain. Note that the terminology for the preservation masters differs for color and black-and-white film.

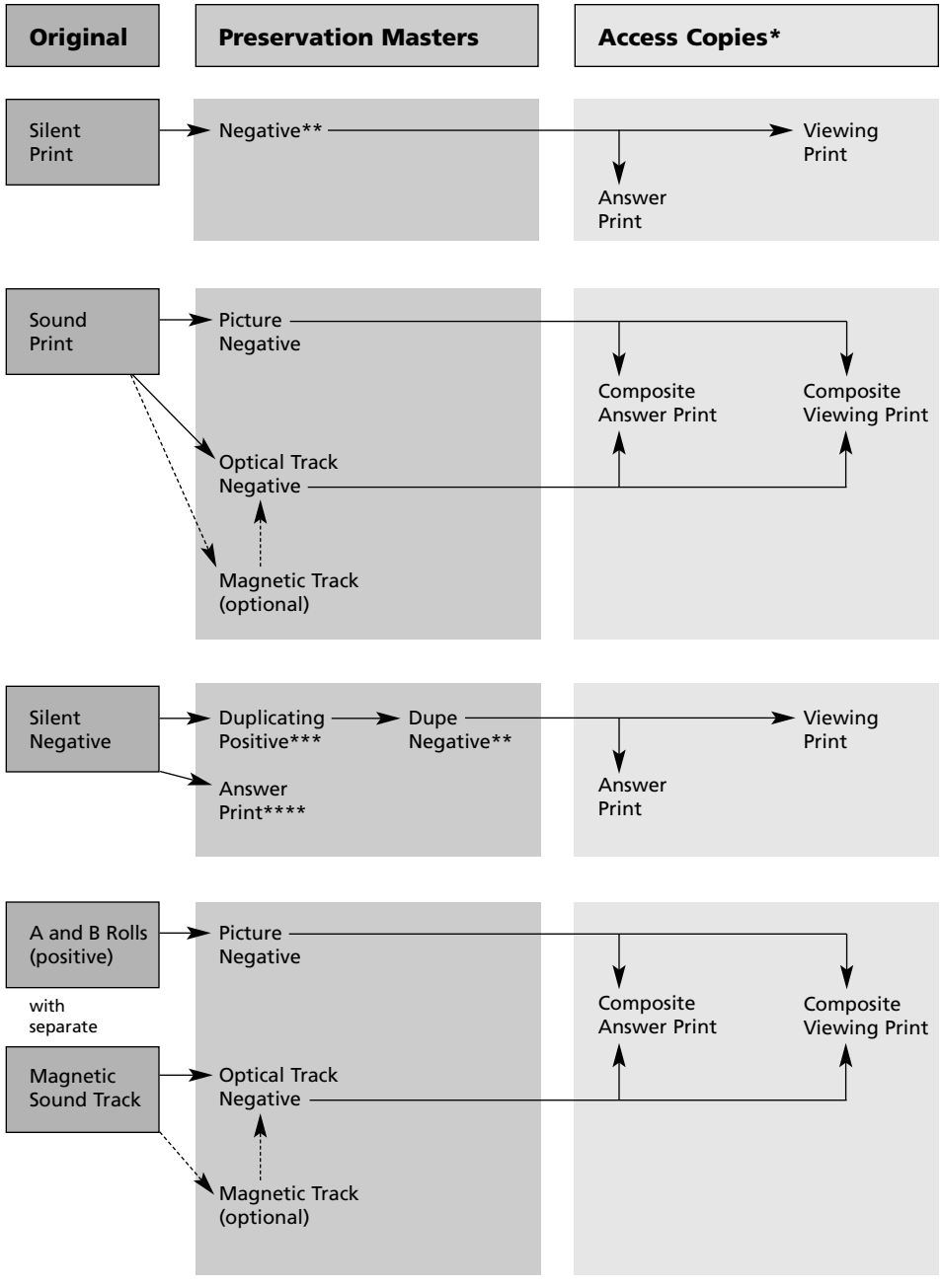
The preservation material provides a master from which copies of the film can be created without returning to the original. The answer print is used to test the quality of the preservation material. Complex restorations may require successive answer prints to obtain the correct

Labspeak

What is the difference between a first trial print and an answer print? Digi Beta, Digital Betacam, and DBC? An intermediate color negative and an internegative? There is no real difference.

Like any technical specialty, the film laboratory field has its own vocabulary. Terms sometimes have similar or even identical meanings. Don't be discouraged by the jargon. Laboratory preservation work is rooted in the processes described in chapter 2 and this chapter. If you don't understand a term that appears in a lab estimate, just ask.

Film Materials Produced in the Film-to-Film Copying Process



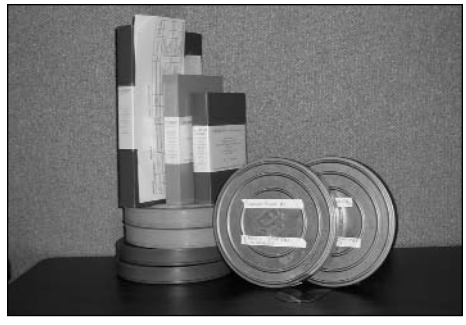
*An acceptable answer print may be used as viewing print. Chart does not include video copies.

**Usually called internegative for color.

***Usually called fine grain master for black and white and interpositive for color.

****This answer print is used to determine the timing for the duplicating positive.

color and brightness. When planning to use an answer print for access, budget-minded preservationists should be sure that the print is "well-timed," that is, produced with the correct color and brightness throughout. Once this is accomplished, subsequent access prints should match the approved answer print.



Preservation materials and access copies produced for a two-reel 1928 silent short.

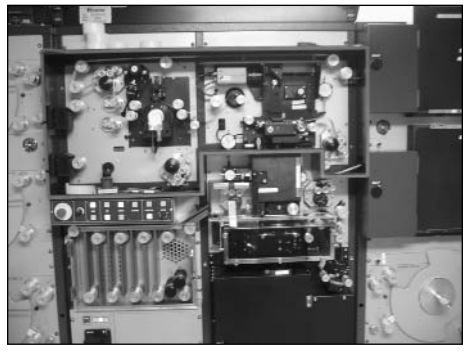
For most public and nonprofit organizations, an acceptable answer print doubles as a viewing print. Videotapes are made either from the print or, with special handling, from the preservation material or master. Having both film and video access copies gives institutions more flexibility in serving the public.

Copying sound film involves additional steps. Sound is usually transferred from the source to a magnetic intermediate, optical track negative, or computer file. This intermediate is used to create a new track negative. The track negative is then re-synchronized with the picture negative. Finally, both are used to produce a new viewing positive with a sound track, called a composite print. In some cases, preservationists will also make an additional back-up copy of the sound track on magnetic sound film, audiotape, or data file to safeguard the full audio range of the original.

5.5 Special Laboratory Processes

Laboratories have developed specialized processes to handle particular gauges and decay problems. The following are some of the more common techniques.

Wet-gate printing. Scratches and abrasions inevitably scar older film materials, particularly reversal originals that have been run through camera and projector. The damage may occur on either the film's base or its emulsion side. With regular "dry printing" lab equipment, some defects can be carried over in duplication and appear as striations or blemishes on the new print. The wet-gate process reduces this problem. During printing the film is temporarily immersed in a chemi-



Wet-gate printer.

cal bath, which helps to fill in scratches, especially on the film's thicker base side.[9] A wet gate can be incorporated into a film printer or a telecine, the device through which film is transferred to videotape.

Optical printing. Introduced to motion pictures in the 1920s for special effects, optical printers have since been adapted for other applications. Unlike contact printers, which print through direct physical contact between the master and raw film stock, optical printers work like projectors. The printer projects the image through a lens and copies it onto the unexposed stock, frame by frame.

Optical printing has long been used to create a film copy in a format different from the master and has become a common tool for transferring 8mm and Super 8mm to 16mm. Optical printers are also employed for duplicating shrunken film.

Digital image restoration. In this process, the motion picture image is scanned to a digital file. There dirt, scratches, and other imperfections are corrected digitally. Then the image can be output back to film or video. When introduced in the mid 1990s, digital restorers had to painstakingly remove damage frame by frame. Now the restoration process can be speeded with the help of computer programs, but it is still prohibitively expensive for most nonprofit and public institutions.

Digital sound restoration. As sound tracks deteriorate, the original recording suffers in quality, resulting in the all-too-familiar hiss, hums, clicks, and pops heard during the screening of older sound films. In the restoration process, the sound is transferred to a digital file, where the anomalies can be corrected at a digital audio workstation. The restored sound is then output to film, often directly from the computer hard drive to sound track elements. The digital data created during sound restoration is archived for future use. Digital sound restoration is already part of the preservation arsenal.

Redimensioning. This last-chance measure is appropriate only for severely shrunken film. Through a chemical treatment affecting the plastic, the shrunken film is allowed to return to a state closer to its original dimensions. The treated film is then fed through the printer before the chemical reaction wears off and the film reshrinks. Redimensioning is a destructive process that may permanently damage the original and should only be used in extreme cases.

5.6 Regular 8mm and Super 8mm

Commercial preservation laboratories have only recently turned attention to Regular 8mm and Super 8mm. With the film industry wedded to 35mm and the educational market to 16mm, there had been little demand. Changing scholarly interests coupled with the Association of Moving Image Archivists's 2001 Small

9. The wet-gate process often has less success in dealing with scratches to the emulsion.

Gauge Initiative have brought about a reassessment of amateur gauges.[10] A number of laboratories now have successful techniques for handling small gauge film. Because of the difficulty in finding and servicing 8mm equipment, most preservationists duplicate 8mm and Super 8mm onto 16mm film.

Some silent amateur films are composed of spliced-together color and black-and-white footage, leading to the question of how to handle differing film stocks in the laboratory. There is no simple rule. As with so many preservation practices, much depends on funding and the importance of the film as an artifact. Generally the solution is to copy the entire compilation onto color film. But, particularly with avant-garde and artist works, the original may be taken apart, the sections duplicated separately onto color or black-and-white film, and then the source material and print reassembled in the original sequence.

5.7 Understanding Laboratory Estimates

Most contractors give written estimates outlining the proposed service and cost. Laboratories are no exception. They base estimates on a description of the project, provided over the phone or by e-mail, or through a physical inspection of the film.[11] Before requesting an estimate, prepare a physical description of your film and think about the products you need. At a minimum, you should have answers to the following questions:

- What is the film title or collection name?
- What is the approximate date?
- What is the gauge?
- Approximately how long is each reel, measured in feet?
- What is the film stock or brand?
- Is the film color or black and white?
- Do you have a positive, a negative, a reversal original, or A and B rolls?
- Does your film have a sound track? What kind is it? Are there separate sound elements?
- What decay and damage does the film exhibit: color fading, shrinkage, warping and curling, image deterioration, tears, broken splices, damaged perforations, vinegar syndrome?
- What masters and access copies are required for your project?
- Will you add credits or other introductory material to the masters and access copies?

10. See, for example, Albert Kilchesty, ed., *Big as Life: An American History of 8mm Films* (San Francisco: Foundation for Art in Cinema, 1998), the catalog of a two-year retrospective organized by the Museum of Modern Art and the San Francisco Cinematheque, and Patricia R. Zimmermann, *Reel Families: A Social History of Amateur Film* (Bloomington, IN: Indiana University Press, 1995). The AMIA compiled a small gauge brochure issued for its 2001 conference; it is available at www.amianet.org/publication/resources/reports/smallguage.pdf.

11. Although more accurate, the latter can be more expensive and time-consuming. Some labs charge a fee for inspection, particularly if the client decides to use another vendor for the duplication project. Most labs bill for return shipping.

Your written inspection report (see 3.3) contains most of this data and can provide a foundation for the estimate.

To compare costs and approaches, preservationists generally recommend obtaining two estimates. The lower bid is not necessarily the better fit for your film. In choosing a laboratory, you should consider not just cost but the laboratory's experience with similar projects, proximity to your institution, scheduling, and customer service attitude. Ask questions regarding the timeline and execution of your project. Engaging a lab is the first step in a collaboration, and you should select a partner with whom you can work effectively.[12]

Ultrasonic film cleaner.

Estimates should cover all stages of the duplication process and itemize all preservation materials and access copies requested by your institution. Let's look at the estimate on the next page. The cost of each procedure is calculated by hour (for labor), by foot (for film), or by piece (for videocassettes). The evaluation and repairs are figured on the basis of time. Films with physical damage are more labor-intensive and cost more to repair. For cleaning, most commercial labs calculate the cost by the length of the original. Generally cleaning is performed with an ultrasonic cleaner, a device in which film is passed through a solvent bath where high frequency vibrations dislodge all but the most entrenched dirt. Hand cleaning is used for fragile film and requires more time.

The preservation master is generally priced per foot, based on the length of the film original. Special laboratory processes such as wet-gate or optical printing can be factored into the cost of the master or reflected as a surcharge. The answer print is also based on the per-foot charge for new film stock.

For most archival projects, the videotape estimate has two parts: the hourly fee for the technician and the use of the facility and the per-unit cost of new videotape cassettes. A closely monitored transfer, during which the lab technician corrects each scene's color, contrast, brightness, and framing, is more time-consuming and expensive than a "one-light" transfer, in which a single setting is used throughout. Finally, depending on local practices, there may be additional charges for cans,

12. Some experienced preservationists take this one step further and contract sound and video components of their projects to specialized facilities. Like general contractors on a home renovation project, they integrate work by several labs into a single project and provide overall direction and quality control.

SAMPLE LABORATORY ESTIMATE

Title: *Excavations at High Mesa*
Source Material: 16mm color reversal original, silent (450 ft.)

Procedure	Amount	Rate	Total
Evaluation and repair	1 hour	_____ per hour	_____
Cleaning	450 ft.	_____ per foot	_____
16mm internegative	450 ft.	_____ per foot	_____
Wet-gate surcharge	450 ft.	_____ per foot	_____
16mm color answer print	450 ft.	_____ per foot	_____
16mm unsupervised transfer to Digi Beta	1 hour	_____ per hour	_____
Digi Beta tape stock	1	_____ each	_____
VHS copy	1	_____ each	_____
TOTAL			_____

This estimate is based on the information provided by the client and may change on physical inspection of the film. Shipping is not included.

Note: Rates and dollar amounts are not included. Prices vary widely from lab to lab, depending on the condition of the film and other factors.

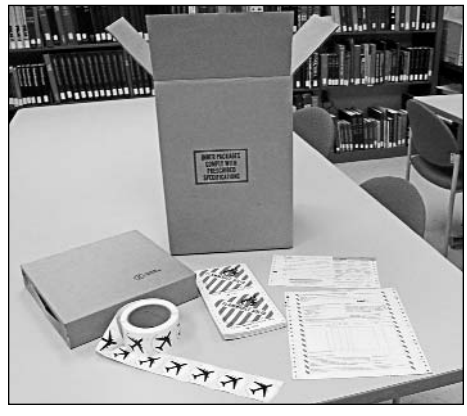
QUESTIONS TO ASK YOUR PROSPECTIVE LAB

1. Can you provide an estimate without inspecting the film? If yes, what inspection information should I provide as a basis for a reliable estimate?
2. How much preparation will be required? Are there tasks that I can do to cut down on your lab's preparation time?
3. How will the film be cleaned?
4. Will all of the operations be performed in-house or will some be contracted out to other facilities?
5. At what point will I be notified if it appears the project's cost will exceed the estimate?
6. Do I have a choice between polyester and acetate film for the preservation elements and viewing copies?
7. Will a lab technician supervise the video transfer and correct individual scenes for brightness and color?
8. What is the expected completion date of the project? Will your lab commit to that date?
9. Can I visit the lab to approve the results?
10. Can I specify the shipping service for the return of my film materials?

shipping, and insertion of credits. Before signing off on an estimate, be sure you understand each phase of the project and check the math.

5.8 Shipping Your Film

Most specialist laboratories are clustered near the East and West Coast film production centers and outside the driving range of many repositories. To transport films to and from laboratories, institutions generally engage commercial shippers. Before shipping, check with your administrative office regarding your institutional insurance policy. Depending on the value of your film, you may need to purchase additional coverage. Most preservationists prefer using carriers with Internet-based tracking services so that they can follow the progress of the shipment.



Federal rules require special packaging and shipping procedures for nitrate films.

For packing, secure the film leader with appropriate tape,[13] avoiding contact of the tape with the film image or sound track. Place the film in a can slightly bigger than the film roll. Fill the space with bubble wrap, paper, or film cores to make a snug fit. Then tape the can shut. Next, place the can horizontally in a clean and sturdy cardboard box with adequate bracing, add bubble wrap or paper to cushion the can, enclose your return shipping address as well as your transmittal memo to the laboratory, and seal the box. Films can be easily damaged in shipping, and it

Shipping nitrate film

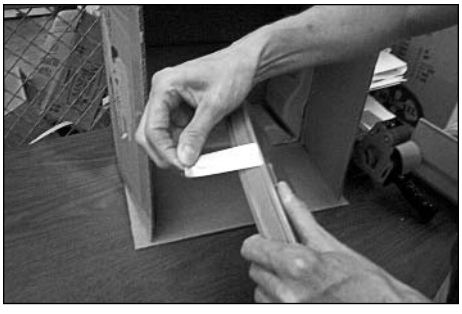
Nitrate motion picture film is considered a hazardous material by the U.S. Department of Transportation (DOT) and can only be handled by an authorized carrier. The DOT requires that the film shipping container display an exterior label declaring the nature and class of the contents and that this outer container meet departmental specifications.

The 2002 *Code of Federal Regulations* (title 49, vol. 2)* outlines special training needs for staff involved in shipping hazardous material. If you have not received this instruction, go to Federal Express or another authorized carrier to arrange nitrate packing and delivery. Avoid shipping nitrate motion picture film during warm weather.

*Available at www.access.gpo.gov/nara/cfr/waisidx_02/49cfr172_02.html. For more on shipping nitrate film, see *Safe Handling, Storage, and Destruction of Nitrate-Based Motion Picture Film*, Kodak Pub. H-182 (Rochester, NY: Eastman Kodak Company, 2003), also available at www.kodak.com.

13. George Eastman House uses an acid-free paper tape from an art supply house. Some archives use cloth tape.

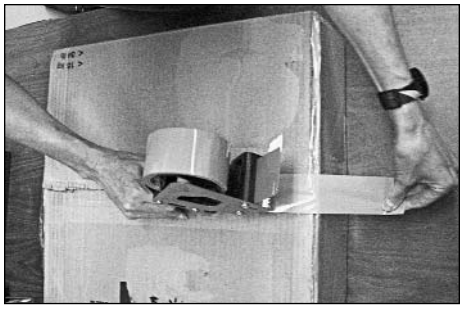
Steps in Packing a Safety Film for Shipping



1. After packing the film roll snugly in the can, seal the can with tape.

2. Place the can in a sturdy shipping box with adequate bracing.

3. Add bubble wrap or paper to cushion the can.



4. Seal the box with packing tape.

Supplies for shipping acetate or polyester film.

is important that you and your preservation lab exercise extreme care in packing film materials.

5.9 Managing Your Project

Interested clients monitor their projects. Your availability will encourage the laboratory to consult with you should complications develop or the work cost more than expected. Once you know the approximate schedule, check with the lab by phone or e-mail as the project nears the expected date of completion. Also find out from your administrative office if your institution will require a purchase order or other special paperwork to process payment.

For the new film preservationist, often the most challenging project management task is quality control. Laboratories generally send the completed masters and access copies to the client for approval before issuing an invoice. The best way to review laboratory work is by projection. The properly projected answer print magnifies exposure and printing flaws. Check the answer print for the following: focus, image stability or "shakiness," graininess,[14] contrast, gray scale or color range, and sound quality. In addition, verify that any added credits or titles appear on the screen for the correct duration and in the specified font. In quality control, keep in mind that some damage, decay, and lighting problems found in the original will be carried over to the copy. First-time film preservationists often invite more experienced colleagues from neighboring institutions to assist in the examination.

Projection equipment must be properly set up and maintained to be used in quality control. If your institution does not have projection equipment, you might arrange to screen the answer print at a local film facility, such as a campus cinema department. Whenever possible, visit the laboratory and view the answer print in the lab's own screening room. This is an excellent way not only to review the print but also to see the laboratory in action. Using the VHS access copy of the answer print as a quality control tool is not satisfactory. Videotape lacks the full resolution of film and, depending on the transfer operation, may exhibit lighting, framing, and other problems not present in the answer print. Never inspect preservation masters by projection. Only experienced preservationists with specialized equipment should review the new preservation master itself.

The completion of a preservation copying project may mark the beginning of screenings and exhibits celebrating the film's availability to the public (see 8.5 and chapter 9). In the United States, repositories have the legal right to make preservation copies for films in their care but generally must secure permissions for public exhibition from donors and rights holders (see 8.6). As a courtesy and an expression of appreciation, organizations often contact filmmakers and donors on the completion of duplication projects involving their films.

14. Film will always lose some resolution between generations, but excess grain may also be the result of technical problems.

5.10 Securing Resources for Film Duplication

While a number of organizations set aside funds for access copies and storage, few institutions budget for film-to-film duplication. Where can repositories find the resources to start?

Many organizations begin through government grants. The National Endowment for the Arts, the National Endowment for the Humanities, the National Historical Publications and Records Commission, and the Institute of Museum and Library Services all support preservation and access projects. Each has its own funding criteria. It is worth reviewing their grant guidelines for applicability to your project.

The nonprofit National Film Preservation Foundation (NFPF) receives federal funds through the Library of Congress to distribute as film preservation grants. It also distributes donated services contributed by preservation laboratories and sound facilities. The NFPF programs give priority to the preservation of historically and culturally significant films made in the United States or produced abroad by Americans. The programs support film duplication in a diverse range of institutions and subject areas; regional materials may receive preservation support if they are indicative of broader national trends or provide important documentation of cultures and themes unrepresented elsewhere.

Other potential sources are local community foundations, private donors, and commercial sponsors, particularly those interested in the subject matter or geographical coverage of particular titles. Sometimes advertisers or film producers will pay for duplication as part of the footage licensing agreement (see 9.4). Museum planners may contribute support for films that complement an exhibition theme. Holidays, anniversaries, and festivals can trigger similar opportunities.

Films cannot be appreciated until they are seen. Some institutions new to film duplication have found it effective to begin with works of broad interest and use the access copies to leverage support and public interest. The University of Minnesota's Bell Museum of Natural History received a grant to make preservation duplicates of two ecology documentaries produced in the 1950s. Armed with video copies and the validation brought by the award, the museum incorporated the films into a local exhibit and into a new university course on the history of the nature film. East Tennessee State University won a grant to make preservation and access copies of several locally produced shorts documenting Appalachian folklife. With this success the university secured another grant to inventory the films and mustered faculty support to restructure the collection into a teaching and research resource. The importance of access in fueling preservation support is discussed in chapter 9.

In film duplication the preservationist makes a master from which copies can be created. In restoration the preservationist goes further and creates a new version that corrects past damage to the film's sound and image. The first case study profiles a duplication project; the second discusses a sound track restoration effort.

Case Study: California Pacific Medical Center

***White Water and Black Magic* (1939, 1,600 ft., 16mm, color and black and white, silent), preserved by the California Pacific Medical Center.**

Richard Gill's Amazon expedition, documented in *White Water and Black Magic*.

One of the treasures of the California Pacific Medical Center Library is the Richard C. Gill Curare Collection. Stricken by multiple sclerosis, Gill traveled in 1938 to the jungles of Ecuador in search of a cure. He returned with specimens, field footage, notes, photographs, artifacts, and raw curare, the botanical extract used to poison arrows. Gill edited his Kodachrome and black-and-white expeditionary footage into *White Water and Black Magic*. The documentary includes some of the earliest color film of the Amazon Basin and shows the process of making curare. Although curare was not effective against multiple sclerosis, medical researchers found its active ingredient a useful surgical muscle relaxant.

For years the Gill Collection was consulted largely by anesthesiologists and historians, but with the posting of photographs on the medical center's Web site, interest grew. The library realized that it needed to provide access to *White Water and Black Magic* in a way that would protect the original. The film had less than 1% shrinkage but had perforation damage.

So began the library's first film preservation project. The library selected a nearby preservation laboratory, touring the facility to learn more about the operation. The lab proposed two options for handling the compilation film: Print it entirely on color stock or print the black-and-white and color sections separately and combine the two prints. Armed with costs estimates provided by the lab, the library applied for a grant and received funding for the first approach.

As work neared completion, the library turned its attention to storage. The medical center planned a new climate-controlled vault for the library, but completion was years away. As a short-term solution, the library acquired a frost-free refrigerator to house the original as well as the new preservation masters and answer print.

The last challenge was access. Looking to the time when the film could be posted on its Web site, the library chose to make an access copy on Digital Betacam tape. From the tape it then made an inexpensive DVD for researchers.

California Pacific Medical Center's decision to preserve *White Water and Black Magic* led to improvements in the institution's film care and made it possible for researchers to study this documentary without damaging the original.

Case Study: Visual Communications

***Cruisin' J-Town* (1976, 1,200 ft., 16mm, color, sound), preserved by Visual Communications.**

Jazz-fusion band Hiroshima, profiled in *Cruisin' J-Town*.

Since the early 1970s, Visual Communications, the nation's first Asian Pacific American media arts center, has produced film, audio, and video exploring the Asian Pacific American experience. *Cruisin' J-Town*, directed by Duane Kubo, was one of the first films it produced. Set in Los Angeles' Little Tokyo, the documentary profiles the jazz-fusion band Hiroshima and discusses the social consciousness that inspired the group.

Given the importance of the music in *Cruisin' J-Town*, Visual Communications budgeted to restore the sound track as well as preserve the image. The center retrieved the best surviving source materials—the original 16mm color negative and 16mm magnetic track—from its off-site climate-controlled storage facility and began the process of restoring the sound.

First, a specialist sound laboratory cleaned the original track and recorded it to digital audiotape. Next, a restorer digitally cleaned the sound to remove the hum, pops, and hiss and equalized it to provide balance across the audio frequencies. As an extra measure of quality control, Visual Communications invited Kubo and band member June Kuramoto to review the results. The center then worked with the restorer to re-sync the sound with the image. Finally, the restored track was returned to the first sound lab, which copied it to a new magnetic track and created a 16mm optical track negative.

A third lab was then enlisted to evaluate the original negative and produce a 16mm interpositive using the wet-gate process to minimize the carryover of scratches and abrasions. From the interpositive the lab will create an internegative and finally a 16mm composite print marrying the 16mm optical sound track with the image. At the end of the process, Visual Communications plans to make available 16mm prints of *Cruisin' J-Town* for screenings. It will also copy the film to digital tape and produce VHS viewing copies for researchers.

Going the extra steps to restore the sound, Visual Communications believes, will help audiences recapture the excitement of Hiroshima's music and the period documented in *Cruisin' J-Town*.

6. Storage

Improving storage is the single most important step that institutions can take to protect their film collections. This chapter outlines the benefits brought by cold and dry storage and suggests options available to cultural repositories. It also discusses film containers, nitrate segregation, and other storage issues particular to the motion picture. Cold and dry storage wins preservationists a measure of control over the film decay process and buys time for preservation copying.[1]

6.1 IPI Recommendations for Film Materials

Temperature and moisture are the two key factors affecting the rate of film deterioration. Fresh acetate film stored at a temperature of 65°F and 50% RH (relative humidity) will last approximately 50 years before the onset of vinegar syndrome. Just reducing the temperature 15°, while keeping the humidity at the same level, delays the first signs by 150 years.[2] Low temperature and low relative humidity levels slow chemical decay and increase the stability of motion picture film.

For nearly two decades the Image Permanence Institute (IPI) at the Rochester Institute of Technology has studied the effect of light, heat, pollutants, and humidity on film and paper decay and developed tools to diagnose and measure these problems. In conjunction with this guide, IPI has produced the *IPI Media Storage Quick Reference*, a publication bringing together information on storing photographs, audiotapes, videotapes, CDs, and DVDs, as well as motion picture film. Recognizing that many repositories house these media together, IPI has developed climate condition charts to enable preservationists to choose storage solutions that maximize benefits to a fuller range of their collections. This section distills some of the key recommendations for motion picture materials. Consult the IPI Web site (www.rit.edu/ipi) and the *IPI Media Storage Quick Reference* for more detailed information.

The IPI charts reflect the recommendations of the International Organization for Standardization (ISO). The ISO publishes standards defining the environmental conditions that promote the stability of specific media. The IPI charts present the

1. This chapter is drawn largely from the following sources: Peter Z. Adelstein, *IPI Media Storage Quick Reference* (Rochester, NY: Image Permanence Institute, Rochester Institute of Technology, 2004); James M. Reilly, *Storage Guide for Color Photographic Materials: Caring for Color Slides, Prints, Negatives, and Movie Films* (Albany, NY: University of the State of New York, New York State Education Department, New York State Library, New York State Program for the Conservation and Preservation of Library Research Materials, 1998); *IPI Storage Guide for Acetate Film: Instructions for Using the Wheel, Graphs, and Tables* (Rochester, NY: Image Permanence Institute, Rochester Institute of Technology, 1993); the Kodak Web site, www.kodak.com; and Film Forever: The Home Film Preservation Guide, www.filmforever.org.

2. As estimated on the wheel in the *IPI Storage Guide for Acetate Film.* The film acidity at the onset of vinegar syndrome measures approximately 1.5 on an A-D Strip (see 2.6).

TABLE 8. HOW TEMPERATURES AFFECT FILM MATERIALS
(when RH is between 30% and 50%)

Film Material	Room 68°F (20°C)	Cool 54°F (12°C)	Cold 40°F (4°C)	Frozen 32°F (0°C)
Nitrate film*	Likely to cause significant damage	Likely to cause significant damage	Meets ISO recommendations	Provides extended life
Acetate film*	Likely to cause significant damage	Likely to cause significant damage	Meets ISO recommendations	Provides extended life
Polyester film	B&W: May be OK Color: Causes significant damage	B&W: Meets ISO recommendations Color: Causes significant damage	B&W: Provides extended life Color: Meets ISO recommendations	Provides extended life
Videotape, magnetic sound track, and prints with magnetic sound track	May cause significant damage	Acetate: May be OK Polyester: Meets ISO recommendations	Acetate: Meets ISO recommendations Polyester: May be OK	May cause significant damage
DVDs	May be OK	Meets ISO recommendations	Meets ISO recommendations	May cause significant damage

Source: *IPI Media Storage Quick Reference*.
*Nitrate and acetate base film should be frozen if there are signs of decay.

ISO recommendations in a format that is easy to apply in collection planning. They simplify the temperature data into four categories, each characterized by a single midpoint temperature value: ROOM (68°F), COOL (54°F), COLD (40°F), and FROZEN (32°F). Climate conditions are rated on a four-level scale based on their effects on the stability of materials: NO (likely to cause significant damage), FAIR (does not meet ISO standards but may be OK), GOOD (meets ISO recommendations), and VERY GOOD (provides extended life). In reality, of course, the relationship of temperature to the decay rate of collection materials is a continuum. Generally the lower the temperature, the slower the decay.

Table 8 summarizes how temperature affects the longevity of motion picture materials when the relative humidity remains between 30% and 50%.[3] To evaluate how your storage conditions measure up, you will need to know your film storage area's average temperature and confirm that its relative humidity is generally between 30% and 50% (see 6.3).

3. Relative humidity is the ratio of the amount of water in the air to the maximum air can hold at that given temperature. The higher the RH, the more moisture will be present in a film. With high relative humidity levels, film decay advances more rapidly and mold is more likely to grow.

If you are unable to gather this information by computer, you can use an inexpensive thermohygrometer, which measures both temperature and relative humidity.[4] Once you have the temperature and relative humidity readings, pick the category that is closest to the average of your storage area and look down that column. For example, if your storage temperature is 45°F, your conditions would be considered cold. If your average temperature is midway between two categories, your environment will share the characteristics of both.

For most film materials IPI finds that frozen temperatures, if RH is held between 30% and 50%, extend useful life. However, DVDs and materials having a magnetic layer—magnetic sound track and videotape—may be damaged under freezing conditions. For mixed collections that include all types of film-related media, cold (40°F) seems preferable.

Composite prints with magnetic sound tracks present a perplexing case. If a print in advanced decay is frozen to conserve the film base, there is a risk of damage to the sound track. However, if the film base succumbs to vinegar syndrome, the entire artifact is lost. Until more scientific research has been completed on magnetic track damage, IPI recommends considering the film base as the determining factor and freezing the original.

Table 8 also points to the damage caused by room-temperature storage. Room temperatures accelerate the chemical decay of magnetic tape and nitrate, acetate, and color films. Just lowering the temperature to cool (54°F), while falling short of ISO standards for most film materials, brings a significant improvement.

IPI has developed a tool to help you estimate how long newly processed film materials might last under your present storage conditions. The Preservation Calculator, available on the IPI Web site, illustrates how storage conditions influence the decay rate of collection materials. It shows how temperature and relative humidity work together to speed or slow deterioration.

To use the calculator, download the program and input the temperature and relative humidity of your storage area by using the sliding gauge. The calculator will estimate the number of years before your films exhibit significant signs of deterioration. The calculator also approximates the risk of mold. Mold spores will not germinate if the relative humidity is below 65%. Light and air circulation also discourage mold growth.

6.2 Improving Film Storage Conditions

If your storage environment does not adequately protect film materials, your organization has several ways to make improvements. The choice depends on collection size, availability of resources, frequency of use, and institutional commitment to preservation.

4. A simple thermohygrometer can be purchased from a conservation supply house for under $50. More complex instruments with a higher degree of accuracy cost more. Some of the supply houses listed in appendix D carry these devices.

Cold storage vaults. For large and medium-size collections the best solution is often an insulated cold storage room with humidity control and air circulation. IPI recommends a desiccant-based dehumidification unit that will control humidity for the entire storage area. With this arrangement, no additional desiccants are needed in the packaging of individual films (see 6.6). It is important that the walk-in cold room be used solely for storage and not do double duty as work space. Many repositories protect the security of their cold storage areas with a locked door or security system.

Cold storage vault, set at 40°F and 30% RH, with films shelved horizontally.

Refrigerators and freezers. Small media collections can be accommodated in off-the-shelf frost-free freezers or refrigerators. A major challenge in using freezers and refrigerators is protecting film from high humidity during storage. This can be achieved by careful packaging. (The critical issue of protecting films from condensation when they are removed from a freezer or refrigerator is discussed in 6.4.)

Freezing to slow advanced vinegar syndrome

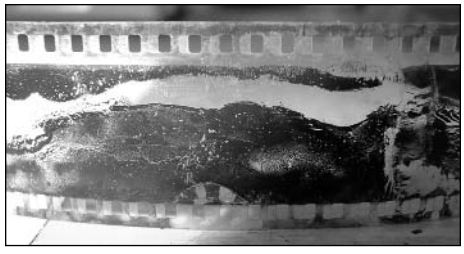
Acetate films at the A-D Strip level of 2 (see 2.6) are at a critical threshold in the decay process. At this point the chemical deterioration rapidly accelerates and the artifact soon becomes unusable. Acetate films in advanced decay should be copied immediately or frozen until duplication is feasible.

Film Forever: The Home Film Preservation Guide (www.filmforever. org) illustrates the steps in packaging a film for refrigeration or freezing. To protect each film, you will need a rigid film container[5] and either resealable polyethylene freezer bags or heat-sealable laminate bags made of layers of aluminum foil and polyethylene or layers of aluminum foil, polyester, and polyethylene. The laminate bags provide better protection, but for convenience, let's assume you are using heavy-duty zip-sealed freezer bags.

Sealed film bags in freezer. Frozen storage is not advised for reference prints or frequently consulted materials.

Start by removing the lid from the film can and bringing the film and packaging materials to room temperature and a relative humidity not exceeding 60%. If the film and packaging have been kept at

5. The rigid container provides physical protection for the film in the freezer.



Storing film on the floor or in areas prone to water seepage, such as basements, can result in water damage. Here water has washed away the emulsion from deteriorated nitrate film.

these conditions for some time, you can start work. If the film has been in hot and humid conditions, it might take several weeks to reach the acceptable relative humidity threshold.[6]

PLACES *NOT* TO STORE FILM

1. Basements (often have high humidity) or on the floor
2. Attics (hot in summer and have fluctuating temperature throughout the year)
3. In direct sunlight or next to a window
4. Near heaters, radiators, or sprinklers
5. Near chemical, paint, or exhaust fumes
6. For magnetic sound tracks, near magnetic fields such as those produced by heavy-duty electrical cables, electrical equipment, and transformers

Once the film has been conditioned to room temperature and a relative humidity not exceeding 60%, close the film can and seal it with tape. Place the can in the bag, press out the extra air, close the seal, and secure it with tape. Be sure to label the bag clearly so that the title can be read without reopening. Then repeat the operation to double-bag the can, securing the final seal with tape. The film is now ready for refrigeration or freezing.

OFF-SITE STORAGE. A third option is to rent storage space from a commercial vendor. A number of North American firms operate film storage facilities—some

QUESTIONS TO ASK POTENTIAL STORAGE VENDORS

1. What is the temperature and relative humidity? At what intervals are these environmental conditions monitored and corrected?
2. What types of materials will be stored in the same storage room as my films?
3. When films are needed, are they paged or retrieved self-service style?
4. If the films are paged, what is the staging procedure for removing and returning films to storage?
5. What level of security is practiced?
6. Do you have back-up generators in the case of power failure?
7. Do you have a disaster plan?
8. How is storage space priced?

6. For a discussion of the dangers of condensation and the steps to control it, see Reilly, *Storage Guide for Color Photographic Materials*, 34–44.

underground and others in climate-controlled buildings. Most Hollywood studios use commercial facilities to store back-up materials in remote locations. By geographically separating film materials, they gain extra protection in case one location is destroyed by flood, earthquake, fire, or other disaster. Remote storage is viable only for materials that are infrequently consulted.

Sometimes organizations with small film collections arrange to store their originals and masters with larger nonprofit or public film repositories. Some organizations have also formed consortia and pooled resources to develop group storage space.

6.3 Monitoring the Storage Environment

Maintaining good storage conditions requires vigilance. IPI recommends continuous monitoring of the temperature and relative humidity either through remote sensors connected to a computer system or electronic data loggers linked to a personal computer.[7] Data loggers recording both temperature and relative humidity can be purchased for under $100. Some specialized systems also check for air contaminants and pollutants. You can also take regular temperature and relative humidity readings of your storage area using a thermohygrometer or a thermometer and a hygrometer. The manual approach requires a greater investment of staff time.

Coping with power failure

Freezers and refrigerators will slowly heat up during a blackout. In this situation, avoid opening the door, and allow the films to come gradually to room temperature. Films protected in moisture-proof housing should not be harmed by melting ice. Generally if the door has remained closed, the films can be returned directly to the original conditions when the power returns.

By analyzing and using the data obtained through these tools, your organization can assure that the temperature and humidity are maintained within an acceptable range and protect against seasonal fluctuations. Small spikes in temperature and relative humidity, such as the ones caused by a short power failure, do not pose a threat to media collections. In general it is more important to keep the average long-term temperature and relative humidity within acceptable bounds than to maintain them at a constant level.

6.4 Removing and Returning Films to Storage

Sometimes films in cold storage are needed for public service or preservation work. When moving films from a cold or frozen environment to room temperature, steps must be taken to protect the materials from condensation. This can be accomplished by either of two methods.

7. Information about IPI's Climate Notebook software and Preservation Environment Monitor is available on the IPI Web site. For a comparison of the Kiwi, ACR, and Onset data loggers, see Judy Ritchie, "Temperature, Humidity, and Light: A Comparison of Data Loggers," under "Newsletters" at www.onsetcomp.com.

Some organizations move the needed film to an environmentally controlled "staging" room set at a temperature and humidity that will prevent condensation on film. The temperature and humidity levels for this room should be determined in consultation with your institution's engineer or environmental planner.

An alternative approach is to place the film in a moisture-proof container before removal from the colder environment. Any condensation will then take place on the outside of the container and not on the film. The container may be as simple as a heavy-duty zip-sealed freezer bag.

The length of the warming time depends on the film mass. A large roll of 35mm film will require more time to acclimate to the new conditions than a tiny reel of 8mm film. For ease of implementation, organizations generally have across-the-board staging procedures that they apply to all film gauges and lengths. George Eastman House, for example, keeps its cold vaults at 40°F and 30% RH and its staging room at 55°F and 50% RH. It has a policy of allowing films to acclimate for at least 24 hours before transfer to work areas. This minimum warming time is suitable for most archival settings.

If the relative humidity has remained under 60%, returning films to cold storage is relatively straightforward and can be accomplished without reverse staging. For frozen films follow the procedures outlined in 6.2.

6.5 Storing Nitrate Film

Because it is a potential fire hazard, cellulose nitrate film has special storage needs. The National Fire Protection Association (NFPA) issues guidelines for the construction of cabinets and vaults for storing nitrate-based motion pictures. For small quantities—5 to 150 rolls (25 to 750 pounds), it recommends steel cabinets with a built-in sprinkler system and outside venting to allow the escape of gases produced by decomposition.[8] Larger-scale storage requires special compartmentalized vaults. For nitrate film, the ISO standards recommend a maximum temperature of 36°F and relative humidity between 20% and 30%.

Many localities require compliance with NFPA guidelines. It is worth checking with your fire department regarding local policy.

A few reels of nitrate film can be stored in a frost-free freezer. Most organizations, however, prefer to arrange for off-site commercial storage of nitrate motion picture

8. See National Fire Protection Association, *Standard for the Storage and Handling of Cellulose Nitrate Film*, NFPA 40 (Quincy, MA: National Fire Protection Association, 2001), which can be purchased online at www.nfpa.org. See also *Safe Handling, Storage, and Destruction of Nitrate-Based Motion Picture Films*, Kodak Pub. H-182 (Rochester, NY: Eastman Kodak Company, 2003), also available at www.kodak.com, and Christine Young, *Nitrate Films in the Public Institution*, Technical Leaflet 169 (Nashville: American Association for State and Local History, 1989), originally published in *History News* 44 (July/August 1989).

films or transfer to archives with specialized facilities. Whenever possible, nitrate film should not be stored in storage vaults with safety film. Once nitrate film has reached the point where it cannot be copied (see 2.6), Kodak recommends its disposal by a federally authorized hazardous waste facility.

6.6 What Makes a Good Film Container?

Film containers—boxes or cans—should be convenient to use and should protect the film from dust and physical damage. As the physical unit for organizing collections, containers should also provide a rigid surface for shelving and give some measure of fire and water protection. Some also give additional protection in shipping.

Film containers come in different sizes and designs, some vented to allow air circulation.

Manufacturers make film containers from archival cardboard, plastic, and metal. The ISO publishes standards for enclosures for photographic materials. These recommend that plastic cans be made of polypropylene or polyethylene. Cardboard boxes should be either neutral or buffered and composed of lignin-free materials. Cans made of noncorroding metal are also acceptable. Also, containers should not include glues or additives that might have a chemical reaction with the film, as measured by IPI's Photographic Activity Test.[9]

Sealing film containers

Should preservationists seal film containers or vent them? Much depends on how the film is stored.

If the film is kept at room temperature, a tightly closed container will prevent the escape of acetic acid and can accelerate vinegar syndrome. At room temperature a sealed container will also speed deterioration of nitrate film. As temperature decreases, however, the chemical reaction slows and venting makes less difference.

When storing films in frost-free freezers, an airtight seal is necessary to protect film from the incursion of moisture (see 6.2). Also, seal the can when using molecular sieves.

9. The potential for interaction between photographic materials and their enclosure is measured by the Photographic Activity Test, developed by IPI and accepted as a worldwide standard. The test determines if chemical ingredients in the enclosure will affect the photographic materials. For more information see www.rit.edu/ipi.

Using molecular sieves

Molecular sieves are desiccants placed in a sealed film can to adsorb acetic acid vapors and moisture. The tiny packets are placed between the film roll and the interior wall of the can. The packets should be replaced when they have reached their maximum adsorption level. This process takes about two years at room temperature. As the storage temperature decreases so does the marginal improvement brought by molecular sieves. For diagrams illustrating the use of this product, search "Acid Scavenger," on the Kodak Web site, www.kodak.com.

For most nonprofit and public institutions, molecular sieves are too expensive and time-consuming to use throughout a film collection. Organizations generally employ them selectively.

The cans or boxes you choose will depend on your institution's storage conditions and funding. Whatever type you select, make sure that the container is chemically inert, physically stable, and expected to last as long as the film it houses. The enclosure's size should match that of the film. Always stack containers horizontally so that the film lies flat.

When reusing old cans, make sure that they are completely free of rust, dirt, and structural damage. Any metal can showing signs of rust or breaks in its coating should be discarded.

This 35mm print was stored vertically, without a core. Over time the film roll collapsed, causing severe warpage. Always stack film cans horizontally to avoid this problem.

6.7 Emergency Preparedness

Most repositories have written plans for dealing with fire, floods, or other disasters. These often include lists of staff responsibilities in emergencies, supplies (including some stored off-site) for recovering collection materials, and a priority list of artifacts to evacuate. The plan for the Minnesota Historical Society, for example, covers procedures for disaster discovery, staff notification, damage assessment, insurance, recovery operations, and media inquiries, and provides appendixes with vendor lists, floor plans, and locations of disaster recovery kits. Be sure your film collection is included in your institution's disaster plan.[10]

10. To view some of the society's plan, search "Conservation: Emergency Response" at www.mnhs.org. For emergency preparedness guidelines, see Lisa Mibach, *Collections Care: What to Do When You Can't Afford to Do Anything*, Technical Leaflet 198 (Nashville: American Association for State and Local History, 1997), originally published in *History News* 52 (Summer 1997).

6.8 Long-Range Preservation Planning

By exploiting the benefits of cold storage, preservationists can develop long-range preservation plans for their film collections, providing public access through copies and scheduling film-to-film duplication over many years. Each institution must decide how to balance its preservation and access mission within the resources at its disposal. Northeast Historic Film demonstrates what is possible once cold storage becomes the anchor for institutional decision making.

In 2000, Northeast Historic Film received a three-year challenge grant from the National Endowment for the Humanities to improve conservation and expand educational programs. At the center of the effort was a new storage facility. In this structure, which opened in 2003, the moving image collection is maintained at 45°F and 25% RH. All safety film originals, masters, film copies, and video masters are kept in this environment. Access videos are shelved in the former film storage room, now the staging area, which is set at 65°F and a relative humidity between 35% and 65%. An off-the-shelf frost-free freezer houses acetate materials in advanced decay. All nitrate films have been transferred off-site.

With its storage conditions slowing film deterioration, Northeast Historic no longer has to mount emergency film-to-film duplication projects. When films are acquired, the repository makes low-cost videotapes for public service and moves the originals and new video masters to cold storage.

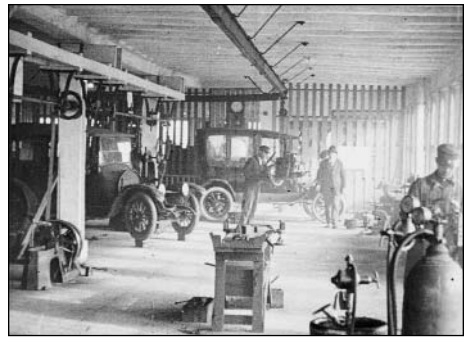
The repository has already copied its small nitrate collection onto safety film and prioritized preservation copying of its other holdings on the basis of age, condition, rarity, geographic coverage, and content. Northeast Historic can now schedule film-to-film duplication when it receives outside grants or gifts.

Table 9. Integrated Film Storage and Duplication Planning at Northeast Historic Film

Storage		
Moving Image Material	**Storage Conditions**	**Expected Life Span**
Access videos	65°F and 35%–65% RH	20 years
Originals, film and video masters, film copies	45°F and 25% RH	Extended
Acetate originals in advanced decay	Frozen	Dependent on film condition
Nitrate originals	Off-site	Dependent on film condition
Duplication		
Access videos	Made when films are accessioned and cataloged	
Film masters and prints	Scheduled, as funds become available, for items of special rarity, age, content, and condition	

Case Study: Nebraska State Historical Society

***Increasing Farm Efficiency, or Delco Farm Lighting* (1918, 2,200 ft., 35mm nitrate, black and white, silent), preserved by the Nebraska State Historical Society.**



Cold and dry storage is the single most important factor in extending the useful life of film. The story of the rescue of *Increasing Farm Efficiency*, a 1918 promotional film for a Delco electric generator franchise, illustrates the causal link.

In late 1918, William B. Lowman of Silver Creek, Nebraska, spearheaded an unusual film project. A natural entrepreneur, Lowman sold kerosene-powered generators for Delco Company and rapidly expanded his business. He was so successful that Delco named him Salesman of the Year for 1918. Lowman invested the cash prize by hiring Harold Chenoweth to make a film about his franchise. The Lincoln-based filmmaker set about demonstrating how electric lighting could transform rural life, filming Lowman's own operations as well as the illuminated interiors of farms, businesses, homes, and even a church.

Increasing Farm Efficiency fell from sight for many years, although it remained the subject of family lore. In 1997, Lowman's great-grandson tracked down a nitrate print and donated it to the Nebraska State Historical Society.

Given the film's casual storage over the years, it is not surprising that the print had suffered damage, from broken sprockets to warping and shrinkage. Ten percent had deteriorated beyond salvage. As an emergency measure, the society immediately made a video copy.

In 1999, with grant support and additional funds from the Nebraska Public Power District, the society sent *Increasing Farm Efficiency* to a laboratory equipped to handle 35mm nitrate. Unfortunately, during the two intervening years the print had continued to deteriorate. Stored at 62°F in a sealed plastic bag, the film had lost an additional 5% of image content. Thus a lesson in film storage came with a high price to this unique work. The lab cleaned and repaired the remaining film. Using wet-gate printing to minimize the carryover of scratches from the source material, the lab produced a new 35mm negative and print.

Increasing Farm Efficiency has been consulted by scholars and local historians and showcased in public programs on filmmaking in the Great Plains. As one of the few surviving works of Chenoweth, the film also serves as a reminder of the many production companies that thrived in the early years of the motion picture.

7. Cataloging by Paul Eisloeffel

In museums, libraries, and archives, description is the key to managing film collections. Description captures essential information about the film's physical characteristics and content and provides a textual link between the item and the user. In cultural repositories, a basic form of description is cataloging.

7.1 The International Framework

Institutions create and use the catalog record in different ways. The record may be produced manually on cards, through an in-house database, or via a networked system. It may provide only fundamental information necessary for access or great detail on an item's history and management.

All repositories practice cataloging in one way or another. In museums, it is the center around which all other collections management tasks revolve. In libraries, it is the essential public access tool. In archives, it is the first step in what may become a more detailed finding aid. Across these many types of organizations, a shared international framework for cataloging is provided by the MARC format, cataloging manuals, and controlled vocabularies.

The MARC format. Over the last few decades, steps have been taken to bring greater standardization to cataloging practices in cultural and scientific institutions around the world. This has come about to some degree because of cataloging's critical role in collection management and access, but also to encourage information exchange among repositories. The best-known data structure standard is the MARC format developed by the library community. MARC, an acronym derived from Machine Readable Cataloging, is a system of recording bibliographic information to facilitate exchange between computer systems.[1] MARC offers a model for structuring and presenting data that is logical and inclusive yet flexible enough to accommodate the requirements of individual repositories.

As a tested framework for structuring and sharing data, MARC has been embraced by much of the archival community. Even the museum profession, which has been slow to develop cataloging standards, has begun to adopt some MARC features.[2]

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1. For background on the MARC format, see Betty Furrie, *Understanding MARC Bibliographic: Machine-Readable Cataloging*, 7th ed. (Washington, D.C.: Cataloging Distribution Service, Library of Congress, 2003), available at www.loc.gov/marc/umb/.
2. There is no universal cataloging standard for museums. Disciplines within the museum community have adopted their own guidelines to suit their subject specialties. History museums, for example, have been especially amenable to MARC.

MARC is now integrated into many collections management software packages for libraries, archives, and museums.

Cataloging manuals. The MARC format is designed to be used in conjunction with cataloging rules. In English-speaking countries, most libraries and many archives describe their materials by following the second edition of the *Anglo-American Cataloguing Rules* (*AACR2*).[3] *AACR2* provides general rules for describing many types of materials, including books, periodicals, maps, music, and audiovisual media. However, catalogers of some special materials, such as films, artworks, or manuscripts, need more specific guidelines to describe their collections. In 1984, this problem was addressed for film and video with the publication of *Archival Moving Image Materials: A Cataloging Manual*. The 2000 version (*AMIM2*) updates the rules to incorporate current practices.[4]

AMIM2 provides a general framework. To document the full range of practice in the field, the Association of Moving Image Archivists (AMIA) compiled and analyzed examples of actual moving image cataloging records from a variety of repositories. The *AMIA Compendium of Moving Image Cataloging Practice* presents "real-life" models from which practitioners may find solutions appropriate for their own holdings.[5]

Controlled vocabularies. Cataloging experts have developed "controlled" or standardized vocabularies to foster consistent language across institutions. These guides generally take the form of thesauruses and present terms in a navigable hierarchy. Again, the library community took the lead with the *Library of Congress Subject Headings*. Specialized groups, such as art museums, have followed with their own vocabularies.[6] For motion picture repositories, there are *Moving Image Materials: Genre Terms* and *Moving Image Genre-Form Guide*.[7]

7.2 Practicing Film Cataloging at Your Institution

Published manuals, compendiums of practices, and lists of terms have helped build a broad national framework for local cataloging systems. Putting this framework into practice at your institution requires some thought about the access points and

3. *Anglo-American Cataloguing Rules*, 2nd ed. (Chicago: American Library Association, 2002).
4. Wendy White-Hensen, *Archival Moving Image Materials: A Cataloging Manual* (Washington, D.C.: Motion Picture, Broadcasting, and Recorded Sound Division, Library of Congress, 1984); AMIM Revision Committee and Motion Picture, Broadcasting, and Recorded Sound Division, *Archival Moving Image Materials: A Cataloging Manual*, 2nd ed. (Washington, D.C.: Cataloging Distribution Service, Library of Congress, 2000).
5. AMIA Cataloging and Documentation Committee, *AMIA Compendium of Moving Image Cataloging Practice* ed. Abigail Leab Martin (Beverly Hills, CA: Association of Moving Image Archivists; Chicago: Society of American Archivists, 2001).
6. See for example the Getty Research Institute's *Art & Architecture Thesaurus OnLine*, at www.getty.edu/research/tools/vocabulary/aat.
7. Martha M. Yee, comp., *Moving Image Materials: Genre Terms* (Washington, D.C.: Cataloging Distribution Service, Library of Congress, 1988); Brian Taves, Judi Hoffman, and Karen Lund, comps., *Moving Image Genre-Form Guide* (Washington, D.C.: Motion Picture, Broadcasting, and Recorded Sound Division, Library of Congress, 1998) is available at www.loc.gov/rr/mopic/migintro. html.

level of detail helpful to your users. Often repositories document local practices by creating their own cataloging manuals and terms lists to supplement the published guidelines.

Data elements. Like other artifacts, film has its own conventions for classification and description. Generally data elements that are used for many types of research materials have been adapted to suit the special characteristics of film. Sources like *AMIM2* and the *AMIA Compendium* define how these data elements are applied. For example, in a film record, the field that libraries call "physical description" or museums call "dimensions" is often used to list the number of reels, length, type of film element, and color and sound characteristics. Similarly the field that museums use to note the name of the artist might cite, in a film record, the names of the filmmaker, producer, and screenwriter.

Cataloging film: common data elements

- Identification/call number
- Title
- Alternate title(s)
- Date(s) of production
- Producer/photographer
- Other credits
- Gauge/format
- Film stock
- Element
- Type of film element
- Color characteristics (color or black and white)
- Sound characteristics
- Length (in feet)
- Running time (in minutes)
- Physical condition
- Summary
- Genre
- Accompanying material

A key data element is the unique identification number that distinguishes an item from all other collection materials. Methods for assigning identification numbers vary with the repository. Libraries, for example, often assign a call number based on the Library of Congress or the Dewey Decimal Classification. Museums typically use a catalog number derived from the item's accession number.[8] In an archive the film identification number is often tied to the collection in which a film belongs. Some film repositories also incorporate data on shelving location into the accession number.

Levels of control. Although library and museum catalogs usually focus on individual items, some films are better described as part of a group. A family's home movies, a series of educational films by a university department, or a film and its outtakes can be treated as a cohesive unit, a collection, to maintain the contextual relationships among the items. It is common to describe collections in a single

8. One of the most common systems for accession numbers is a two-part code consisting of the year of acquisition and the order of acquisition within that year. For example, the number 2003.034 designates the 34th acquisition of 2003. Sometimes a third number is added to indicate specific items within an acquisition. Thus 2003.034.05 indicates the fifth item in the above-mentioned collection.

catalog record and sometimes supplement it with more detailed finding aids, described later in this section.

Films often come into a repository with accompanying documents and artifacts, such as production stills, scripts, advertisements, cameras, and projection equipment. Depending on the local cataloging system, these supplementary materials may be noted in the film record or described separately. Films acquired as part of a larger group, such as family papers or business records, are generally mentioned in the overall collection description, as shown in the record below.

CATALOG RECORD FOR A MULTIMEDIA COLLECTION THAT INCLUDES FILM

Collection Number:	RG3263
Collection Name:	Aldrich, Bess Streeter, 1881–1954
Date(s):	1892–1988; mostly 1925–1940
Size:	Approximately 12 cubic feet of papers; approximately 100 photographs; and 1 reel of 16mm motion picture film.
Abstract:	Bess Streeter Aldrich was an author of novels and short stories. This collection relates to her work as a writer and her personal life, and includes materials related to the motion picture based on her novel *Miss Bishop* (motion picture title: *Cheers for Miss Bishop*).
Access Restrictions:	Not all materials are available for immediate access. Consult with society staff for details.
Use Restrictions:	It is the responsibility of the researcher to pursue permission and copyright issues prior to publication of these materials.

ACCESS POINTS FOR CONTENT. An access point is a name, term, or other data element by which a description may be searched. Searchable fields for film include title, creator, gauge, credits, genre, and other elements listed in the catalog record.

An important access point for many film researchers is subject. Keep in mind that the subject matter of film—like most visual resources—can be rich and complex. Film not only contains a visual, and perhaps auditory, record *of* places, people, events, and objects but also presents information *about* larger yet less tangible concepts and themes. For example, a home movie reel may show images of babies, houses, parades, and automobiles, but the images may also be about childhood, domestic life and architecture, community celebrations, and auto touring. Repositories often use the *Library of Congress Subject Headings* and the *Thesaurus for Graphic Materials I: Subject Terms*[9] as sources for subject terms and supplement these general controlled vocabularies with more specialized lists. In any case, when

9. *Library of Congress Subject Headings*, 26th ed. (Washington, D.C.: Cataloging Policy and Support Office, Library Services, Library of Congress, 2003); Prints and Photographs Division, Library of Congress, comp., *Thesaurus for Graphic Materials I: Subject Terms (TGM I)*, 2nd ed. (Washington, D.C.:, Library of Congress, 1995), also available at lcweb.loc.gov/rr/print/tgm1.

compiling access points to film content, always ask yourself: What are the film's images *of*? What are the images *about*?

More detailed description. As mentioned previously, some films are more coherently described as part of a larger group. In a way, even a single film can be considered a "group" of scenes or shots. Film researchers, in fact, often look within films for short sections documenting particular subjects or points of view.

A single catalog record generally cannot provide this level of detail. To help researchers, repositories often create more detailed guides that serve as a table of contents to a film or collection. These guides vary in specificity and are similar to the finding aids developed by archives for family papers or business records.

The scenes that make up a single film can be individually described in a shot list. A shot list covers the content and sometimes the visual or technical qualities of each segment in the film. Ideally, the catalog record mentions the shot list and alerts the researcher to the availability of this tool.

EXCERPT FROM SHOT LIST FOR *BEEF RINGS THE BELL*

Title:	Beef Rings the Bell
Year:	ca. 1960s
Color:	Color
Shot List:	00:00:41:18–00:05:18:05 Title credit, cartoon w/ cow ringing bell for mealtime. WS PAN cattle herd w/ snow-capped mountains in BG. VS cattle (steers) grazing on ranch. VS of cattle ranch in winter, w/ rancher feeding cows hay. VS of bull cow among herd. Cowboys (men on horses) herding cattle. Cattle in holding pens, fences. Men spraying cattle w/ insect repellent, dipping them, inoculating them against disease. Branding irons. 00:05:18:06–00:08:47:20 Color, sound, ca. 1960s. Cowboys on horses round up cattle in the fall. WS ZO of cows (steers) walking across plain, herding. Cattle in holding pens, grazing. Cowboys leading herd, cattle drives . . .

Integrating film into your institution's catalog. As discussed throughout this guide, a number of preservation and curatorial issues set film apart from other media at cultural repositories. For cataloging, however, film is handled like most other materials. To be sure, the film catalog record includes descriptions of the unique physical and informational qualities of film, but these basics can be incorporated into your existing system.

7.3 Starting from Scratch

For organizations new to film cataloging, sources like *AMIM2* and the *AMIA Compendium* give guidance and abound in practical examples. Other resources include two important collaborative projects now in development.

The Moving Image Collections (MIC) Web site, gondolin.rutgers.edu/MIC, sponsored by AMIA and the Library of Congress and funded by the National Science Foundation, will provide a universal search mechanism for moving image collections and incorporate a union catalog,[10] a directory of organizations, and cataloging tools. As a part of the project, MIC's developers are creating a "flexible but standardized metadata architecture" for the film description based on MARC, Dublin Core, and MPEG-7 metadata standards.[11] They plan to produce a template for general use.

A cataloging template is already available from Independent Media Arts Preservation (IMAP), a consortium dedicated to the preservation of independent electronic media. IMAP has developed a MARC-based cataloging template for film, video, and audio that can be used with FileMaker Pro software. The template, and other useful information, is found at the organization's Web site, www.imappreserve.org.

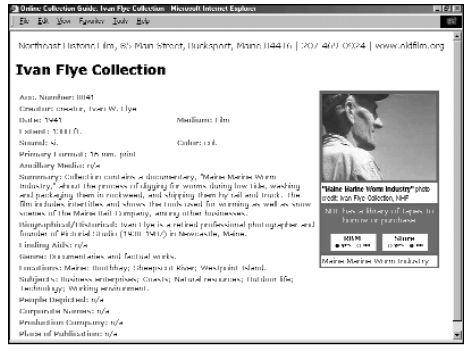
7.4 Sharing Records

The union catalog planned by MIC's developers will be a boon to film preservationists and researchers alike. Until its full implementation, repositories can use systems already in place. For decades libraries and archives have pooled catalog records through two major bibliographic databases, the Online Computer Library Center (OCLC) and the Research Libraries Information Network (RLIN). With the advent of Internet search engines, researchers can also find records directly on institutional Web sites. All these approaches share an important purpose: By making descriptive records of film holdings widely available, repositories not only encourage use and appreciation of film but build the collective record of our cinematic history.

10. A union catalog brings together in a unified sequence information on the contents of more than one repository.
11. The Dublin Core Metadata Element Set and the MPEG-7 Multimedia Content Description Interface are standardized sets of data elements for describing physical and digital materials. For more information see the the Dublin Core Metadata Initiative Web site, dublincore.org.

Case Study: Northeast Historic Film

***Maine Marine Worm Industry* (1941, 1,300 ft., 16mm, color, silent), preserved by Northeast Historic Film.**



Northeast Historic Film's online catalog record for the Ivan Flye Collection.

Cataloging is the link between preservation and access. *Maine Marine Worm Industry*, preserved by Northeast Historic Film, shows how the catalog can open materials to the public and, as the archive puts it, become a way to "get more eyes, ears, and brains engaged with the moving image history of the century."

Maine Marine Worm Industry is an amateur documentary, with intertitles, about harvesting and selling sea worms for fishing bait. It was made by Ivan Flye, a professional photographer who built his Newcastle worm business into a multistate enterprise. Flye donated his film to the archive in 1991. In 2002, with grant support, Northeast Historic Film preserved the film and made videotape reference copies for the public. *Maine Marine Worm Industry* is described in the archive's catalogs.

Northeast Historic Film has two catalogs—one for the public and the other for staff—accessible through complementary databases. The in-house records are more detailed. For each collection, the record describes the physical artifact and gives confidential information on the acquisition history, rights, status of preservation, location of copies, and other vital housekeeping data.

The public records in Northeast Historic's Online Collections Guide, available on the archive's Web site (www.oldfilm.org), have a different purpose. They are the path into the film collection for users across Maine, Vermont, New Hampshire, and Massachusetts. Users can check the catalog by collection name, date, or subject or do a more elaborate full-text search. A search for "Boothbay," "rockweed," or "low tide" brings up the description of Ivan Flye's documentary, along with a streaming video showing worm harvesters at work and information on loan and purchase copies.

While the catalogs were built for the archive's immediate audience, Northeast Historic Film designed its records to comply with international standards. The records employ a stripped-down version of the MARC format and, with some fine-tuning, could be exported to a union database. With this goal in mind, Northeast Historic Film is participating as a MIC test site.

8. Legal Context by Eric J. Schwartz

As caretakers of the nation's film heritage, archives, libraries, and museums need to understand the legal framework in which they work. The context is defined by federal copyright law and donor agreements. Copyright and donor agreements define how institutions preserve their motion picture materials and share them with the public.[1] This chapter briefly outlines some of the major issues, including federal provisions supporting film preservation. For detail and guidance on how copyright and donor agreements affect local policy, preservationists should consult their institutional counsel.

8.1 Copyright

Copyright is the federal protection given to creators or subsequent owners of original films, music, dramatic compositions, art, and other works of intellectual property—whether published or unpublished. It grants authors five exclusive rights to their works:

1. Reproduction (the right to make a copy of the work)
2. Distribution (the right to disseminate physical copies to others)
3. Public performance (the right to publicly screen, broadcast, or show film through various venues including on the Internet)
4. The right to prepare derivative works (for film, this generally means remakes or adaptations)
5. The right of public display (public display embraces the use of frame enlargements and the presentation of video in a museum exhibit)

Divisibility of copyright. Authors may divide and assign their rights by geographic region, media, and time period and may grant rights exclusively or nonexclusively. For example, an independent filmmaker may give one distributor the exclusive right to book screenings of a film in the United States (region) for one year (time period) but assign others the ability to make and sell videos or DVDs. There are innumerable ways that rights can be split, licensed, or transferred. Depositories generally try to secure the transfer of copyright and all the rights therein when they acquire film materials (see 8.4).

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1. Some states have additional laws prohibiting the unauthorized commercial exploitation of a person's name, likeness, or voice, especially in the case of celebrities. Generally speaking, these laws are limited to advertisements or other commercial applications and thus do not apply to most archival uses of film material.

Copyright is generally reassigned through a written document endorsed by the owner or the owner's representative. Certain oral agreements are permitted for nonexclusive uses, but it is always better to "get it in writing" to prevent misunderstandings.

Underlying rights. Further complicating the picture is the matter of underlying rights. Films may contain other already copyrighted works, such as preexisting music, recordings, works of art, or dramatic compositions. The rights to underlying works are often treated separately from the film, especially when the film is in the public domain. Thus, in those cases the reproduction, distribution, public performance, adaptation, and display of the film may also require securing clearance from the rights holders of the underlying works.

Term of copyright. Copyright law has changed over the years, making it difficult to determine the length of copyright protection for some older films. Before 1978, films could generally receive protection for 75 years from the date of their first release. In 1998, the term was extended for 20 years for films still under copyright protection. This extension did not affect films whose copyright had already expired. Thus any film published before 1923 is in the public domain in the United States, although it may still be protected in other countries.

In fact, prior to 1989, when the laws changed, many films did not receive a full 75 years of copyright protection (the initial term of 28 years plus the renewal term of 47 years). To obtain the full duration, copyright owners had to publish their films with the proper copyright notice (©) and file timely copyright renewal forms with the U.S. Copyright Office. Some films slipped through the cracks and entered the public domain in the United States.[2] However, many foreign films were exempted from these old rules in 1996 and may now have a different term of copyright protection in the United States.

The rules regarding copyright term are different for films created after 1977. Films created after December 31, 1977, now enjoy a copyright term of the life of the author(s) plus 70 years. "Works made for hire," films created by contractors or staff employed by an entity to which they assign their rights, receive a term of 95 years from publication or 120 years from creation if the work remains unpublished.

Checking the copyright status of published works. You can check the copyright status of a published work without hiring an attorney. The U.S. Copyright Office Web site (www.copyright.gov) provides this information for post-1977 works. Earlier titles, however, must be searched in person in the catalogs open to the public in the Copyright Office in the Library of Congress. There are professional search firms that specialize in this research.

2. For films published with notice but not renewed, the terms ended after 28 years. Films first published without notice, however, entered the public domain at the moment of publication.

Absent a will or other written agreement, copyright generally transfers to the heirs or estate of the filmmaker.

8.2 Copyright of Unpublished Works

January 1, 1978, marks an important change in the U.S. copyright treatment of films. Prior to that date, federal copyright law pertained only to published films. The law defined published films as those offered widely to the general public in copies for sale, rent, or lease. Under the old law, screening or broadcast did not by itself constitute publication. Thus the published or unpublished status of a film was unclear (and sometimes still is). State laws offered some level of legal protection for unpublished films, often extending coverage "in perpetuity." Unpublished films protected by state laws did not have to comply with federal requirements regarding display of copyright notice, registration, and renewal. Legal changes in 1978 and in 1989 swept aside the old rules and, for the most part, the distinction between unpublished and published films.

All films, whether published or unpublished, are now protected for a finite term under federal copyright law. For pre-1978 films, the protection still differs for published and unpublished works. Figuring out the duration of protection for unpublished pre-1978 works can be complex, particularly if the unpublished work was later published. Many repositories have footage and amateur films that fall into these categories. This is one reason why it is so important that repositories clarify rights issues in the deed of sale, gift, or deposit agreement prior to film acquisition (see 8.4).

For all films created after 1977, federal copyright protection begins on the date the film or its working copy is completed (the "date of fixation"). As mentioned in 8.1, the term is the life of the author(s) plus 70 years or 120 years for unpublished works made for hire. Thus, for newer works the dividing line between published and unpublished films no longer makes much practical difference.

8.3 Physical Materials and Copyright

Before moving on to donor agreements, it is important to clarify a key issue of copyright law. Copyright law distinguishes between the ownership of the copyright and the ownership of the "material object" in which the work is embodied. Thus an institution possessing a physical copy of a film may not have the right to exploit it. Those rights—the rights of reproduction, distribution, public performance, and public display and the right to make derivative works—are retained by the copyright holder unless transferred explicitly to the repository.

This bifurcation can create situations in which the rights holder owns the rights to films for which the holder has no physical material. For example, the Library

of Congress has the only known 35mm nitrate print of *Clash of the Wolves* (1925), the Warner Bros. silent feature starring the original Rin-Tin-Tin. Although the canine action hero was one of the most popular cinema personalities of the 1920s, few copies of his films are known to survive. The unique print was discovered in South Africa and transferred to the Library for preservation copying. Warner Bros. has no original source material for *Clash of the Wolves*, but it still owns the copyright and controls the film's exhibition, distribution, and remakes. Thus, whenever the Library publicly screens its new preservation copy, it must obtain prior approval from the rights holder. To include the work in its forthcoming DVD set of rare silent films preserved by American film archives, the National Film Preservation Foundation (NFPF) asked permission, and Warner Bros. generously granted the request.

An important exception that permits public depositories to make preservation copies of protected films without the rights holder's permission is discussed in 8.5.

8.4 Donor Agreements

Institutions generally include copyright among the many issues addressed during film acquisition. The document defining the relationship between the donor of film materials and the depository is called a donor or gift agreement. Donor agreements are governed by state property, contract, and gift laws. Unless specified in written contract with the depository, copyright generally does not transfer with the physical material.

Donor agreements, as pointed out in the Library of Congress's "Depositing Films with Archives: A Guide to the Legal Issues," can take many forms.[3] The contract puts into writing the expectations of both parties. Generally the agreement covers four major areas: (1) the description of the films, including the ownership of the rights for those materials, (2) the nature of the transaction (whether it is a gift, deposit, loan, purchase, or combination of these), (3) the responsibilities of the depository for the physical materials, and (4) the use of the films (including any restrictions on this use by the depository, its patrons, or the donor).

The agreement may outline the depository's specific duties to copy, maintain, and make available the materials as well as responsibilities for insurance, inspection, and cataloging. The document sometimes includes the timetable for transferring films to the depository and provisions by the donor to help defray the costs of upkeep.

The donor or deposit agreement may also add restrictions on the use of physical materials that go beyond copyright. For example, Technicolor Worldwide Film

3. This paper is included in *Redefining Film Preservation: A National Plan* (Washington, D.C.: Library of Congress, 1994), 49–79, and available at lcweb.loc.gov/film/donate.html. The paper provides an issues checklist and sample agreement language.

Group deposited the original camera negative for *Toll of the Sea* (1922), the earliest surviving feature made in the two-color Technicolor process, with the UCLA Film and Television Archive, which meticulously restored the film. Although the film is no longer protected by copyright, the use of UCLA's restoration is still governed by the deposit agreement made many years ago. To enable the NFPF to include the restored *Toll of the Sea* on the DVD set *Treasures from American Film Archives: 50 Preserved Films*, Technicolor generously provided a letter of permission.

Some active independent filmmakers deposit their films with public and nonprofit institutions under the condition that they retain ownership of the physical materials and be allowed continued access to the originals. The depository makes prints available to researchers and provides secure, climate-controlled storage. Generally in these arrangements, preservation copies made by the depository belong to that institution, although the copyright may remain with the filmmaker.

As discussed in 8.2, unpublished films are also protected by copyright. When acquiring the physical copies of amateur films from a donor, it is important that depositories clarify the rights and use of the materials as part of the gift agreement.

8.5 Archival Rights and Responsibilities

Federal law recognizes the important role of nonprofit and public institutions in saving America's film heritage. It gives depositories, which are "open to the public" and "available not only to researchers affiliated with the library or archives," the ability to copy films for "preservation and security."[4] The institution may make up to three copies of unpublished films. It may also make up to three copies of published works that are damaged, deteriorating, lost, or stolen if copies are unavailable from the copyright owner.

Film archives interpret this provision, as well as "fair use," described in 8.7, to embrace the creation of a preservation master, answer print, and access copy. Furthermore, a depository may ship its own copy to a sister institution, if consideration is given to the film's well-being and storage and if no additional copies are made by the recipient.

Unless forbidden by its gift agreement, the depository may make films available for on-site study by researchers without the approval of the copyright holder or the transfer of rights. However, as noted in 8.6, it may not exhibit these works without permission.

When permitted by its donor agreements, a depository holding copyrights may license those rights to others for any type of commercial or noncommercial use,

4. The reproduction in a digital format is permissible for the preservation and security of unpublished films and to replace damaged, lost, or deteriorating copies of published films. The digital copies cannot be "made available to the public in that [digital] format outside the premises of the library or archives."

including screenings, broadcasts, or reproduction of still images in publications. Licensing agreements generally spell out the territory, duration, and intended use of the film material (see 9.4). Each depository should work closely with its institutional counsel to develop any licensing agreements.

8.6 Obtaining Permissions

As summarized in 8.1, public performance is one of the creator's five basic rights under copyright law. For motion pictures, the rights holder controls where and how the holder's film is publicly screened and transmitted. For any performance "to the public," depositories must obtain permission from the copyright owner. In copyright law, public performance is generally defined as "any place where a substantial number of persons outside of a normal circle of a family and its social acquaintances is gathered." It also embraces television and cable broadcast, since the protection encompasses places where "the public is capable of receiving" the performance. Whether an admission fee is charged is irrelevant.

Posting films on the Internet is considered a public performance and also requires permission. So, digitizing and uploading a film to an institutional Web site, absent the rights holder's permission, is a copyright infringement.[5]

8.7 Fair Use

Sometimes individuals will claim that their use of film stills or clips in a public lecture or publication is "fair use" and does not require permission from a copyright holder. What does this mean?

The guidelines for determining fair use are set out in the law as four broad considerations and not defined through explicit examples. These factors are (1) the amount of the copyrighted film to be used, (2) whether the use has a commercial or noncommercial purpose and whether the user is "transforming" the work into something new and useful, (3) whether the copyright owner's income (or the work's market potential) will be affected by the use, and (4) whether the work is published or unpublished.

The courts ultimately decide whether a particular use is fair or not, based on past cases or precedents. Unpublished works are generally granted more protection.

5. For a discussion of the legal issues surrounding digital copies of copyrighted works, see June M. Besek, *Copyright Issues Relevant to the Creation of a Digital Archive: A Preliminary Assessment* (Washington, D.C.: Council on Library and Information Resources: Library of Congress, 2003). Also available at www.clir.org/pubs/abstract/pub112abst.html.

8.8 Protecting Your Institution

Given the complexity of these issues and increasing public interest in using film, it is important that your institution's legal rights and responsibilities for its films are understood by all employees. The unauthorized use of films by staff or researchers can lead to institutional liability. Similarly, breach of a donor agreement could, in a worst-case scenario, lead to the forfeiture of the material.

Copyright liability applies whether or not an individual or organization knows that an action constitutes infringement. Simply making an illegal copy or publicly screening a film once without permission can leave your institution vulnerable to civil fines. The best approach is to work with your organization's counsel to develop policies for licensing agreements, public screenings, Internet use, and other film usages, and to educate staff on how to implement them.

If your institution owns full rights to a film or can negotiate necessary permissions with all appropriate rights holders, it may well serve your institution's interest to explore many avenues for providing access. By legally sharing what you have preserved, you will help build appreciation for your institution's work as well as an audience for film preservation.

Case Study: University of Texas at Austin

***Norman Bel Geddes' Hamlet* (1931, 2,000 ft., 16mm, black and white, silent), preserved by the Harry Ransom Humanities Research Center, University of Texas at Austin.**

Intellectual property rights are often complex, particularly for works involving celebrities and artists. Nevertheless, through agreements with rights holders, archives can find ways to satisfy both their public service and their preservation missions, as the following story illustrates.

Norman Bel Geddes' 1931 production of *Hamlet* is among the most celebrated of the visionary stage and industrial designer's works. His innovative designs for sets, lighting, and sound emphasized the psychological state of the characters, an approach that was controversial at the time. As he developed these production elements, he documented them on film.

The resulting hour-long documentary, along with the scripts, drawings, and promptbooks from the stage production, were among the personal papers acquired by the Harry Ransom Humanities Research Center in 1958 shortly after Bel Geddes' death. Through the sale the center acquired the physical collection and the ability to make it available for scholars. The Bel Geddes estate, however, retained the intellectual property rights to the material. Although it does not appear that Bel Geddes registered his *Hamlet* documentary for copyright, the film still has protection as an unpublished work.

U.S. copyright law gives archives the right to copy films for preservation but does not give them the right to screen the new copies in public programs without the permission of the rights holders. Thus when Bel Geddes' *Hamlet* was discovered to have vinegar syndrome in 1999, the center faced a problem common to many cultural repositories. It had the responsibility to preserve the physical artifact but did not have the right to publicly exhibit the result.

Preservation, of course, is in the interest of the rights holder as well as the public. Receiving a grant to preserve *Hamlet*, the center used the opportunity to renegotiate access arrangements with the Bel Geddes estate and received permission to screen the film in conjunction with its 2003 exhibition *Make It New: The Rise of Modernism*. Parties wishing to publish material from the Norman Bel Geddes Papers must continue to obtain the estate's permission, as did the NFPF for the above photograph.

9. Access

To be of any educational or entertainment value, films must be seen. Virtually every repository provides on-site research access to its motion picture collections. But public access to film involves much more. Access embraces the full range of activities through which scholars, students, filmmakers, film enthusiasts, and the general public study and view film held by public and nonprofit institutions.

This chapter briefly discusses traditional on-site service to researchers in institutional reference facilities and describes other diverse and imaginative ways through which organizations are reaching wider communities.[1]

9.1 On-Site Research Access

Providing service to researchers is key to every repository's mission. The challenge for film is finding ways to provide intellectual access to the content without endangering the original. Generally most organizations achieve this balance by providing access through film, video, or digital copies.

As mentioned in 5.2, videotape has become the preferred access medium for most repositories. It is inexpensive, convenient, and easy to use. VHS videos can be viewed on off-the-shelf consumer electronics equipment and are far less costly to make than film prints. As tapes become worn or damaged, they can be readily replaced. Because most researchers know the rudiments of operating a VCR, they can play the tapes without extensive instruction or supervision.

A number of repositories now videotape film originals during cataloging or when requested by researchers. Some organizations order these tapes from commercial video transfer specialists. Others create copies in-house on telecine equipment or with a modified projector and camera connected to a video recorder.

Some budget-minded repositories make low-cost videotape access copies in-house using an Elmo film-to-tape transfer unit.

For significant or heavily consulted items, a few repositories make higher-quality video masters as an additional level of protection for the original. Subsequent video copies can be generated from the video master without returning to the film source. As costs drop, preservationists are moving to digital videotape as the medium for the video master.

1. The International Federation of Film Archives (FIAF) devoted the entire December 1997 issue of its *Journal of Film Preservation* to access. This publication is available on the FIAF Web site at www.fiafnet.org/pdf/uk/fiaf55.pdf.

Digital video is of sufficient quality for broadcast and can be output to DVD for researchers or to tape for licensing requests (see 9.4).

Using video or digital copies of works originally produced on film does not substitute for the experience of viewing the films themselves. The video and digital copies lack the resolution and pictorial qualities of film and when projected, do not offer the same visual experience. That said, video and digital copies can make films accessible to individual researchers without endangering film prints. Since many scholars and researchers view film for its evidentiary and documentary value, often access via video or digital copies will suffice.

Many film museums continue to give scholars the experience of viewing film copies instead of videotape. Although a few project reference film prints in screening rooms, most provide individual viewing on a flatbed editing table.

With the advent of video and digital copies, film repositories now enjoy a variety of options for serving on-site researchers. Digitization is sure to provide even more opportunities. As technologies change, the fundamental principle remains the same: Use copies to provide access to the film content and protect the original.

9.2 On-Site Public Programs

Preservation screenings are among the most gratifying activities for the preservationist. Viewing a newly preserved film with an audience, the way the film was intended to be experienced, is also a public way of demonstrating what has been accomplished through the preservation process.

A number of organizations make film exhibition part of their public programs. Some use the events as a means of sharing the results of preservation efforts and celebrating film preservation. UCLA, for example, hosts a biennial Festival of Preservation showcasing recent restoration and preservation work. The 2002 festival featured 23 programs over a four-week period and received wide press coverage. Preservationists often introduce the screenings and talk with the audience about the process of saving older films.

Several Friends (1969), directed by Charles Burnett, among the films showcased at the 11th UCLA Festival of Preservation in 2002.

Preserved film can also become an integral part of lectures and museum installations. The Utah State Historical Society illustrated a lecture on the exploration of the state's southern canyon lands with home movies taken by celebrated river guide Harry Aleson. In the early 1950s, Aleson explored and filmed many areas

that were subsequently submerged under the waters of Lake Powell. The society's program was so popular that it was repeated. The South Dakota Art Museum, part of the state university, took another approach. The museum made preservation copies of two films about prairie painter Harvey Dunn. One included the only known footage of the painter at work. The moving image material was used in an exhibit on Dunn that was installed for the museum's grand reopening in 2000. It should be remembered that before screening films, institutions may have the responsibility to secure permission from copyright holders and donors (see 8.6).

9.3 Internet Exhibition

Exhibiting films on the Internet is still in its infancy, but the presentation of the Paper Print Collection through the Library of Congress's American Memory project shows what is already possible. The collection contains more than 3,000 films registered for U.S. copyright protection between 1894 and 1915. At that time federal copyright law had no provision for motion pictures, but film companies could protect their work as still photographs and did so by depositing contact prints on rolls of paper 35mm wide. These copies proved more lasting than most turn-of-the-century nitrate film and were rephotographed years later, frame by frame, on film. Intended as legal documentation, the collection now provides the key to understanding the evolution of the motion picture in the United States.

For decades scholars consulted these early films at the Library and ordered copies for classroom use. Now thanks to American Memory, a large selection of these films is open to any computer user linked to the Internet. The motion pictures are indexed and searchable by keyword and title on the Library Web site, www.loc.gov. Users may download copies. Because the paper prints are in the public domain and made available through a federal Web site, they may be consulted and reused in any way the user wishes.[2]

What Happened on Twenty-third Street, New York City (1901), among the paper prints available on the Library of Congress Web site.

9.4 Licensing

Archival motion picture collections are a reservoir of historical and cultural documentation. What was once largely the province of scholars is becoming a resource for commercial productions and a supplementary source of revenue for

2. The Prelinger Archives, discussed in 4.4 and accessible at www.archive.org/movies, provides another example of the film access possibilities afforded by the Internet.

some institutions. Granting permission to outside parties to reuse archival motion picture materials in other contexts is called licensing.

Many organizations strive to provide this extra service, if not barred by copyright or donor restrictions (see 8.1, 8.4). Generally repositories define a license for moving image materials in terms of territory, duration, and intended use.[3] The fee usually reflects these factors as well as the exclusivity of the license and the rarity of the source material. Repositories confirm the arrangement through a written contract or a licensing agreement, which specifies the terms of use and can provide protection from legal action should the materials be misused.

Frame enlargements. For many years the making of frame enlargements—still photographs that reproduce a single frame of the motion picture—was a cumbersome operation that required specialized photographic equipment. Digital technology has revolutionized the process. Now single film frames can be captured as an image file using a digital camera or a film scanner. Videotape can also be reproduced, although the image will have lower resolution.

Some film archives offer digitized frame enlargements as part of their service menu for researchers. George Eastman House provides these reproductions for motion pictures that are represented by preservation materials and are in the public domain. Frame enlargements have long been a feature of scholarly cinema history publishing. As more institutions acquire scanning equipment and expertise, frame enlargements will undoubtedly become common in a wider range of publications. Repositories may license frame enlargements as well as footage.

Frame enlargement from *Kindred of the Dust* (1922), a Raoul Walsh melodrama preserved by George Eastman House.

Licensing footage. Documentarians, theatrical filmmakers, television news producers, music video creators, and advertising agencies all look for fresh moving image materials for their productions. Some organizations have been able to harness fees from such users to help pay for duplication and storage. The University of South Carolina Newsfilm Library provides a case in point.

In 1980, the university received 11 million feet of nitrate newsreel footage, and the rights to these materials, as a gift from Twentieth Century Fox. The Movietone News Collection includes outtakes, or unused sequences, that were filmed between 1919 and 1934 as well as selected World War II material. Users can search the

3. For a discussion of licensing for museums, see Michael S. Shapiro and Brett I. Miller, *A Museum Guide to Copyright and Trademark* (Washington, D.C.: American Association of Museums, 1999), 123–46.

online catalog at www.sc.edu/newsfilm. The site also includes a rate card and sample films for Internet viewing. The newsfilm library fields some 150 requests a year. The licensing revenue helps offset the costs of maintaining climate-controlled storage.

Unidentified woman aviator (ca. 1920s), from Movietone News outtakes preserved by the University of South Carolina Newsfilm Library.

Institutions often waive licensing fees for educational uses that further public exposure and knowledge of their collections. West Virginia Public Radio, for example, ran a year-long radio series, *Time Trail West Virginia*, that used sounds to illuminate events important to the state. The West Virginia State Archives contributed sound tracks from news films without charging the usual fee.

If rights and agreements permit, institutions may also elect to offer selected material from their collections for free downloading and reuse over the Internet. Unrestricted collections of this kind are heavily used by teachers, students, and independent and community mediamakers and serve as excellent promotion for the repository and its activities.

9.5 Loan and Distribution

Many film archives have active loan programs for 16mm and 35mm exhibition prints. Because of the value and expense of film copies, institutions lend generally only to exhibitors willing to take special care in handling and projecting prints.

Some depositories build lectures or special events around newly preserved films. The Harry Smith Archives reconstructed Harry Smith's *Mahagonny*, a kaleidoscopic portrait of the 1970s New York City art scene featuring appearances by Patti Smith, Allen Ginsberg, and other underground icons. The Getty Research Institute in Los Angeles hosted the premiere of the restored film along with a day-long symposium bringing together art historians, music specialists, and preservationists. The restoration has since been shown in film festivals around the world.

For films with a broad constituency, some organizations are turning to video and DVD to circulate copies outside their walls. Northeast Historic Film, for example, gives borrowing privileges to individuals and organizations that join as members. From a collection of 300 videos relating to northern New England, titles may be requested in person or by phone, mail, or e-mail. Roughly one-third of the lending library represents films in the archive's own collections. The video catalog is searchable on the organization's Web site, www.oldfilm.org. Over the years the program has made thousands of video loans to schools, community groups, assisted-living facilities, and individuals throughout the region.

PROJECTING ARCHIVAL FILM PRINTS

Film archives regard exhibition prints as museum objects and carefully control their use. They lend prints only to borrowers that exercise proper projection practices and routinely clean and service projection equipment. Poor handling harms the print and leaves damage that will be seen by the next audience. Guidelines for handling archival prints are posted on the Library of Congress Web site at lcweb.loc.gov/film/project.html.

The National Center for Jewish Film disseminates film as well as videotape. As a nonprofit distributor of moving images relating to the Jewish experience, it provides copies of Yiddish-language works preserved by the archive as well as independent documentaries and narratives. These copies are shipped to film festivals, nonprofit theater venues, community groups, synagogues, and schools around the world. Depending on the title, users rent 16mm or 35mm prints or buy videocassettes. Preview cassettes are available to researchers and programmers for the cost of postage.

Love and Sacrifice (1936), a Yiddish-language feature preserved and distributed by the National Center for Jewish Film.

9.6 COMMUNITY OUTREACH

Many organizations collect and preserve films relating to their region. These films can open a window into a community's history and forge a palpable link with the past. Often repositories bring such films back to the groups that created them. By reaching out in nontraditional ways, they are educating new audiences about their institution's mission and the need to collect and preserve film. The approaches taken by archives, libraries, and museums are as varied as the films themselves. Mentioned here are two examples.

The Florida Moving Image Archive takes its films on the road—literally. Each month it conducts three to four tours on buses equipped with video monitors for showing amateur and news films of Miami neighborhoods. Narrated by a local historian or archive staff, the tours provide insight into past events and changing urban neighborhoods. Often riders share facts and stories about the places and periods represented in the films. Over the years senior citizen groups, churches, schools, and architectural preservationists have arranged for special thematic charters. The tours have proved so popular that the archive recently branched out into

"illustrated history" cruises of the Miami waterfront. For the bus and the boat tours, riders pay a modest fee.[4] The tours have heightened public awareness of the archive's programs and led to donations.

Inside the bus on the Florida Moving Image Archive's Magical History Film and Video Tour.

The Alaska Film Archives of the University of Alaska Fairbanks has also taken its films into the community—the Alaskan native settlements of the North Slope and southwestern Alaska. With National Endowment for the Humanities funding, the archive searched its collections for moving images of Yup'ik, Inupiaq, and Athabaskan people and assembled 26 hours of raw footage. At pilot screenings at the Alaska Native Arts Festival and at Alaska Confederation of Natives meetings, it received guidance on how to present the materials to native audiences. It then took selected footage to four communities in spring 2003. In group sessions, more than 300 people viewed the images, identifying individuals, places, and events. To those who found pictures of family members the archive gave free frame enlargements and videos. For some, these images were the only known portraits of deceased relatives. The information gathered in the field was added to the university's catalog records. The goodwill generated by this outreach project has led the archive to explore extending the effort to other regions.

With video editing software now a standard feature on many computer systems, organizations are beginning to use moving images to tell their history and muster resources for film preservation. Johns Hopkins University's Communications Office prepared a video titled *Institutional Amnesia* to draw attention to the plight of the university's scattered film collections. The University Medical Center had been a pioneer in medical filmmaking, producing a film on hospital operations in 1932 and sending a motion picture camera with its medical unit during World War II. Other parts of the university filmed special events, sports, and student activities. The films were largely forgotten by campus administrators. Documentary filmmakers interviewed for *Institutional Amnesia* argued that Johns Hopkins was letting a national asset slip away. The video, which is viewable at www.jhu.edu/~gazette/2003/21jul03/21amnes.html, has helped bring about a new film preservation effort within the university library.

4. For more on the Florida Moving Image Archive's outreach programs, see Patricia R. Zimmermann, "Magical History Film and Video Bus Tour," *Moving Image* 3 (Spring 2003): 161–63.

Case Study: Minnesota Historical Society

***Sugar Bush, Chippewa Handicraft, The Moccasin,* and *Wild Rice Harvest* (1935–47, 2,000 ft., 16mm, color, silent), preserved by the Minnesota Historical Society.**

Making maple sugar, as shown in the Minnesota Historical Society's educational video of Monroe Killy's films.

Access to Native American moving images is important to the Ojibwe communities in Minnesota. Because so much of the Ojibwe culture is transmitted from generation to generation by spoken word and demonstration, moving images of elders at work can be an especially effective learning tool for children. The story of the Monroe Killy films illustrates how preserved films can be used outside the archive in new and inventive ways.

Monroe Killy documented the life and customs of the Ojibwe in northern Minnesota on film in the 1930s and 1940s. He obtained permission from the elders to film wild ricing, maple sugaring, canoe building, tanning, and other traditional tasks. Killy edited the footage into four films with descriptive intertitles and distributed prints to schools and libraries.

The Minnesota Historical Society purchased the films and rights from Killy in 1976. The films caught the interest of the native community. The challenge became getting the images back to the groups they documented.

In 2000, the society received a grant to preserve the films and share videotape copies through the state's tribal education network. To connect with contemporary fifth- to eighth-grade students, the films needed contextualization, and the society engaged a Native American teacher to write a viewing guide. In developing lesson plans, the writer talked with elders and with Killy, then in his nineties.

The final product, titled *Ojibwe Work*, is a 36-page booklet and VHS videotape. The guide provides cultural background, lists locations, translates the intertitles into Ojibwe, and suggests activities for making the films come alive for students. The society donated copies to Indian reservations and schools across the state.

Educators have been enthusiastic. Wrote a fourth-grade teacher in the Cloquet School District, "The fact that [the Killy films] are so authentic and capture the more traditional Indian way without any 'Hollywood' filmmaking techniques makes them so interesting." A school administrator in Fond du Lac reported, "They illustrate the overall continuity of seasonal activities, yet students can note the changes that have occurred over the years. . . . The films are a real treasure."

Appendix A: Edge Code Chart

These charts reproduce the date edge codes from Kodak and Dupont motion picture film. To date your film, find the film's edge code and select the matching code on the chart. Kodak repeated symbols every 20 years, so you will need additional data to pinpoint the date. For 8mm edge codes used after 1965, see the Web site www.filmforever.org. Fuji film uses a four-digit code; the first two numbers represent the year of manufacture. For more on using edge codes for dating, see 3.3.

EASTMAN KODAK DATE CODE CHART					
1922	1942	1962	● ■	1982	● ■ X
1923	1943	1963	● ▲	1983	X ▲ X
1924	1944	1964	▲ ■	1984	▲ ■ ▲
1925	1945	1965	■ ●	1985	■ ● ▲
1926	1946	1966	▲ ●	1986	▲ ● ▲
1927	1947	1967	■ ▲	1987	■ ▲ ▲
1928	1948	1968*	● ● ●	1988	+ + ▲
1929	1949	1969	+	1989	X + ▲
1930	1950	1970	▲ +	1990	▲ + ▲
1931	1951	1971	● +	1991	X + X
1932	1952	1972	■ +	1992	■ + ▲
1933	1953	1973	+ ▲	1993	+ ▲ ▲
1934	1954	1974	+ ●	1994	+ ● ▲
1935	1955	1975	+ ■	1995	+ ■ ▲
1936	1956	1976	●	1996	X ● ▲
1937	1957	1977	■	1997	X ■ ▲
1938	1958	1978	▲	1998	X ▲ ▲
1939	1959	1979	● ●	1999	● X ▲
1940	1960	1980	■ ■	2000	■ ■ ▲
1941	1961	1981	▲ ▲	2001	▲ ▲ ●

DUPONT DATE CODE CHART	
1956	**KL**
1957	**KN**
1958	**KS**
1959	**LN**
1960	**LS**
1961	**NS**
1962	**K**
1963	**L**
1964	**N**
1965	**S**
1966	**KLT**
1967	**KNT**
1968	**KST**
1969	**LNT**
1970	**LST**
1971	**NST**
1972	**KT**
1973	**LT**
1974	**NT**

WHERE EASTMAN KODAK STOCK WAS MANUFACTURED

S•A F E T Y - ROCHESTER
S A F•E T Y - ENGLAND
S A F E T•Y - AUSTRALIA
S A•F E T Y - CANADA
S A F E•T Y - FRANCE

Source: Adapted from a design by Lauren Jones-Joseph, Sabucat Productions.
*The code for 1968 is **++**.

Appendix B: Print Condition Report

A print condition form was developed by Chad Hunter of George Eastman House as an instructional tool for workshops held during fieldwork for this guide. Before the sessions, each participant sent a film print to Eastman House for inspection. Staff preservationists recorded their findings on the form and returned the prints and completed reports to participants. The findings were discussed at the workshops. This form can be downloaded from the National Film Preservation Foundation Web site, www.filmpreservation.org.

Collection/Title: Edward Weyer Collection/Weyer-Brazil 1953/Assignment Amazon

Length: 486 feet (image to image)

Black & White _____ **Color** X (Kodachrome)

Silent _____ **Sound** _____

Gauge: 16mm

Material: X Triacetate ___ Diacetate ___ Polyester

Generation: X Positive X Reversal

___ Fine Grain ___ Soundtrack Only X Image Only

Language/Head Titles/Intertitles/Subtitles: English

Physical Damage

Marked on a scale of 1 (slight) to 4 (heavy)

0-1	**Emulsion Scratches**	2.5	**Projector Oil & Dirt**
0-1	**Base Scatches**	0	**Warpage**
2.5	**Perforation Damage**	.4%-.5%	**Shrinkage**
0	**Edge/Perforation Repair**	0	**Color Fading**

Number of Splices: 89 cement splices. Four "popped" or open splices—which have been wrapped into film—not repaired. Several other weak splices which will likely pop if handled more

Vinegar Syndrome (Acetate Decomposition Level)* 0

*Marked on a scale of 0 (no deterioration) to 3 (critical)

Notes: Edge code reads "square plus," which correlates to 1952. Approximately one dozen pulled sprocket / torn perforations throughout print. 2 areas which have chunks missing from edge, and will likely tear open upon handling. At 407 feet to tail of print, mold has begun to eat away portions of the image in cycles of 1 foot—approximately three or four frames every foot. The emulsion damage ranges from minimal to 75% loss of image (per four frames). It progresses nearer to the tail. Original can is rusty, and needs to be replaced. Early form of desiccant in can contains high amount of mold, and should be discarded. Reel is rusty, and should be replaced or film should be put on core. Mold was wiped from edges of film using 50% Perchloroethylene and 50% Simplex projector oil.

Completed by CH **Date** 1/29/03

Appendix C: Selected Film Preservation Laboratories

Audio Mechanics (*sound track*)
1200 W. Magnolia Blvd.
Burbank, CA 91506
Phone: 818-846-5525
Web site: www.audiomechanics.com

BB Optics
108 Franklin St.
New York, NY 10013
Phone: 212-966-6253
Web site:
www.bboptics.com/bboptics.html

Bono Film and Video Services
3200 Lee Hwy.
Arlington, VA 22207
Phone: 703-243-0800
Web site: www.bonofilm.com

Brodsky & Treadway (*film-to-video-tape transfer of reversal originals*)
P.O. Box 335
69 Warehouse Ln.
Rowley, MA 01969
Phone: 978-948-7985
Web site: www.littlefilm.com

Chace Productions Inc. (*sound track*)
201 S. Victory Blvd.
Burbank, CA 91502
Phone: 800-842-8346
Web site: www.chace.com

Cinema Arts Inc.
Huckleberry Hill, Arts Building
Angels, PA 18445
Phone: 570-676-4145

CinemaLab
2735 S. Raritan St.
Englewood, CO 80110
Phone: 303-783-1020
Web site: www.westerncine.com

Cineric Inc.
630 Ninth Ave., Ste. 508
New York, NY 10036
Phone: 212-586-4822
Web site: www.cineric.com

Cinetech
27200 Tourney Rd., Ste. 100
Valencia, CA 91355
Phone: 877-492-9000
Web site: www.cinetech.com

Colorlab Corp.
5708 Arundel Ave.
Rockville, MD 20852
Phone: 301-770-2128
Web site: www.colorlab.com

Crest National
6721 Romaine St.
Los Angeles, CA 90038
Phone: 323-860-1300
Web site: www.crestnational.com

DJ Audio (*sound track*)
10806 Ventura Blvd., Ste. 2
Studio City, CA 91604
Phone: 818-760-1673
E-mail: djaudio@aol.com

Note: This is a selective list of American commercial laboratories experienced in the preservation copying and restoration of motion pictures. It is provided as a public service and does not constitute an endorsement by the National Film Preservation Foundation. For a fuller listing of film and video laboratories, see the Association of Cinema and Video Laboratories Web site, www.acvl.org.

DuArt Film and Video
245 W. 55th St.
New York, NY 10019
Phone: 800-523-8278
Web site: www.duart.com

Erickson Archival Telecine
(*film-to-video transfer*)
11900 Baltimore Ave., Ste. E
Beltsville, MD 20705
Phone: 301-210-9988
Web site: www.ericksonarchival.com

Film Technology Company Inc.
726 N. Cole Ave.
Los Angeles, CA 90038
Phone: 323-464-3456
Web site: www.filmtech.com

FotoKem Film and Video
2801 W. Alameda Ave.
Burbank, CA 91505
Phone: 818-846-3101
Web site: www.fotokem.com

Monaco Film Labs
234 Ninth St.
San Francisco, CA 94103
Phone: 415-864-5350
Web site: www.monacosf.com

NT Audio Video Film Labs
(*sound track*)
1833 Centinela Ave.
Santa Monica, CA 90404
Phone: 310-828-1098
Web site: www.ntaudio.com

Summit Film Lab & Media Services
1020 Napor Blvd.
Pittsburgh, PA 15205
Phone: 412-937-9333
Web site: www.summitfilmlab.com

Technicolor Creative Services
4050 Lankershim Blvd.
North Hollywood, CA 91608
Phone: 818-505-2835
Web site: www.technicolor.com

Trackwise Inc. (*sound track*)
123 W. 18th St., 7th Fl.
New York, NY 10011
Phone: 212-627-7700

Triage Motion Picture Services
516 N. Larchmont Blvd.
Los Angeles, CA 90004
Phone: 323-962-7420
Web site: www.triage.to

YCM Laboratories
3140 Clybourne Ave.
Burbank, CA 91505
Phone: 818-843-5300

Appendix D: Selected Equipment and Supply Vendors

Film Equipment and Supplies

Christy's Editorial Film and Video Supply
3625 W. Pacific Ave.
Burbank, CA 91505
Phone: 800-468-6391
Web site: www.christys.net

Hollywood Film Company
3294 E. 26th St.
Los Angeles, CA 90023
Phone: 323-261-3700
Web site: www.hollywoodfilmco.com

J&R Moviola
1135 N. Mansfield Ave.
Los Angeles, CA 90038
Phone: 323-467-3107
Web site: www.moviola.com

Motion Picture Enterprises Inc.
P.O. Box 276
Tarrytown, NY 10591
Phone: 212-245-0969
E-mail: info@mpe.net

Neumade Products Corp.
30–40 Pecks Ln.
Newtown, CT 06470
Phone: 203-270-1100
Web site: www.neumade.com

Film Containers and Conservation Supplies

Conservation Resources International
5532 Port Royal Rd.
Springfield, VA 22151
Phone: 800-634-6932
Web site:
www.conservationresources.com

FPC Inc.
6677 Santa Monica Blvd.
Los Angeles, CA 90038
Phone: 800-814-1333
Web site: www.fpcfilm.com

Gaylord Bros.
P.O. Box 4901
Syracuse, NY 13221
Phone: 800-634-6307
Web site: www.gaylord.com.

Light Impressions
P.O. Box 787
Brea, CA 92822
Phone: 800-828-6216
Web site:
www.lightimpressionsdirect.com

National Film Preservation Products Inc.
3236 Union St.
North Chili, NY 14541
Phone: 585-594-1026
Web site: www.nfppi.com

Note: This is a selective list of firms that specialize in motion picture equipment, containers, and conservation supplies. It is provided as a public service and does not constitute an endorsement by the National Film Preservation Foundation. For photo shops serving amateur filmmakers and links to sources for 8mm and Super 8mm equipment and supplies, see Film Forever: The Home Film Preservation Guide, www.filmforever.org.

Plastic Reel Corporation of America
Western Region
8140 Webb Ave.
North Hollywood, CA 91605
Web site: www.prcofamerica.com

RTI Tek Media Supply Company
4700 W. Chase Ave.
Lincolnwood, IL 60712
Phone: 800-323-7520 or 847-677-3000
Web site: www.rtico.com/tekmedia

Stil Design
3, Valliere St., Ste. 103
Quebec City, QC
G1K 6S9, Canada
Phone: 888-414-0449
Web site: www.stildesign.com

Talas
568 Broadway
New York, NY 10012
Phone: 212-219-0770
Web site: www.talasonline.com

Tayloreel Corporation
P.O. Box 476
Oakwood, GA 30566
Phone: 770-503-1612
Web site: www.tayloreel.com

Tuscan Corporation
7115 Virginia Rd., Ste. 111-6
Crystal Lake, IL 60014
Phone: 888-457-5811
Web site: www.tuscancorp.com

Urbanski Film
P.O. Box 438
Orland Park, IL 60462
Phone: 708-460-9082
Web site: www.urbanskifilm.com

Glossary

Covered here are film preservation terms and abbreviations mentioned in this guide. Definitions reflect the usage in the text. For additional film preservation terms, see the technical glossary included on ScreenSound Australia's Web site, www.screensound.gov.au, and FIAF's *Glossary of Filmographic Terms*, compiled by Jon Gartenberg. For definitions of genres, film types, and technical terms more common to filmmaking or exhibition, see Kevin Jackson's *The Language of Cinema*. For general archival terminology, see SAA's *A Glossary for Archivists, Manuscript Curators, and Records Managers*, compiled by Lewis J. Bellardo and Lynn Lady Bellardo.

A and B rolls Paired production elements that are printed in succession to hide transitions or splices between shots and to produce fades or dissolves. Created by splicing negative or positive film into two rolls. Where one carries the picture, the other has black or blank leader.

Access copy Film, video, or digital copy used for public service.

Acetate Short for cellulose acetate. Film base introduced as safe, nonflammable substitute for nitrate base film.

Acetate decay Chemical deterioration of acetate plastic accelerated by high relative humidity and temperature. Also known as vinegar syndrome because of the odor released during the decay process.

ACVL Association of Cinema and Video Laboratories (www.acvl.org). International organization serving film and video laboratory professionals.

A-D Strips Diagnostic tool developed by the Image Permanence Institute to test the level of acetate decay in cellulose acetate base film.

AMIA Association of Moving Image Archivists (www.amianet.org). Professional organization for film, video, and television archivists and preservationists.

Analog videotape Videotape that records sound and image information using frequency-modulated signals. Digital videotape, in contrast, records information as numeric values.

Answer print First positive film copy in which each scene has been corrected for brightness and color. Created to check the quality of the production, printing, or preservation elements. Usually presented to the client for approval. Also known as trial print.

Balance stripe On composite prints the magnetic stripe affixed to the film edge opposite the edge carrying the magnetic sound track. With a stripe along both edges, the film produces a more even roll when wound.

Base In motion picture film, transparent layer that supports the photographic emulsion. Can be made of cellulose nitrate, cellulose acetate, or polyester plastic.

Betacam SP A format of analog videotape that measures one-half inch in width and is packaged in a cassette.

Binder In motion picture film, the material in the emulsion that holds the image-forming particles or dyes.

Blowup Film made in a larger format than the original, such as a 16mm print made from an 8mm original. Also called enlargement.

Buffered Cardboard that has been chemically treated to adjust acid content prior to its use in film containers.

Camera original Film exposed in the camera.

Cellulose acetate Family of transparent plastics introduced as a nonflammable substitute for cellulose nitrate base film. Film with an acetate base is often called acetate film.

Cellulose diacetate Earliest safety film base.

Cellulose nitrate Transparent plastic used as the base in the earliest 35mm film stock. Highly flammable, cellulose nitrate base film was phased out in the early 1950s. Film with a nitrate base is often called nitrate film.

Cellulose triacetate Strongest acetate film base used for motion picture film.

Check print Usually a one-light positive film copy created to check the quality of the production, printing, or preservation elements.

Color correction In the transfer of film to video, the process of adjusting the color and brightness from scene to scene. The term is used to describe adjustments made during transfer of either black-and-white or color film.

Color fading Decay of photographic images caused by the chemical instability of the dyes. As the dyes break down, contrast is also lost and the film eventually takes on a washed-out monochromatic look.

Color reversal intermediate Film stock introduced in the late 1960s for making internegatives directly from negatives or internegatives and interpositives directly from interpositives. No longer in use, it is identified by its black edges and the orange cast of color images. Often abbreviated as CRI.

Combined print Film positive carrying both picture and sound track. Also known as composite print or married print.

Composite print Film positive carrying both picture and sound track. Also known as combined print or married print.

Conservation Processes and activities resulting in the protection of the film original.

Contact printing Laboratory process in which a film copy is made through direct physical contact between the source material and raw film stock.

Core Hub on which film is wound for storage.

CRI Color reversal intermediate. Film stock introduced in the late 1960s for making internegatives directly from negatives or internegatives and interpositives directly from interpositives.

Data logger Electronic instrument used to record temperature, relative humidity, light intensity, and other variables that affect collection materials.

Diacetate Short for cellulose diacetate. Early safety film base.

Digi Beta Short for Digital Betacam.

Digital Betacam A format of one-half-inch digital videotape that is packaged in a cassette. Also known as DBC, Digi Beta, and Digibeta.

Digital videotape Videotape that stores picture and sound as numeric values. Analog videotape, in contrast, records picture and sound information using frequency modulated signals.

Duplicate negative New negative created in the preservation copying of positive black-and-white film. This preservation element may be made from an original print or from a duplicating positive. Sometimes shortened to dupe negative or dupe neg.

Duplicating positive Generic term for the new positive intermediate created during preservation copying from a negative original. For black-and-white film the duplicating positive is called a finegrain master; for color film, it is called an interpositive.

Duplication Making a surrogate copy.

DVD Optical disc used for storing digital information, including moving images.

Edge code Symbols printed along the edge of the film by the manufacturer to indicate production data, such as date and location of manufacture.

8mm Film gauge introduced in 1932 for the amateur market. Measures 8 millimeters in width.

Emulsion Image-forming layer within motion picture film.

Emulsion in Film wound so that the emulsion side faces the center of the reel.

Emulsion out Film wound so that the base side faces the center of the reel.

Enlargement print Print made on a larger format than the original, such as a 16mm print made from an 8mm original. Also known as blowup.

Equalization In sound preservation, the process of changing the level or volume of selected frequency ranges to improve overall sound quality.

Exhibition print Positive created for film screenings. Also known as show print.

FIAF La Fédération Internationale des Archives du Film/International Federation of Film Archives (www.fiafnet.org). International association for film archives and museums.

Film cement Solvent used to join two pieces of film, thus creating a splice. Cements now on the market cannot be used with polyester film.

Film cleaner Solvent applied to the film surface to remove dirt, oil, dust, and wax. Commercially available film cleaners can be toxic and should be handled as directed on the manufacturer's material safety data sheet.

Film viewer Machine with screen for viewing film at a workstation. Film viewers range from simple tabletop devices to sophisticated flatbed editing consoles.

Fine grain master New duplicating positive made in the preservation copying of black-and-white film. This intermediate preservation element is created from a negative source and is used to produce a duplicate negative from which new prints can be created. Sometimes shortened to finegrain.

Footage Measurement of film length in feet or frames. Also used to describe unedited positive film.

Footage counter Measurement device that counts feet or frames of film. Industry models may also indicate run time and time code.

Format Term referring to the dimensions of the apertures used in motion picture cameras and projectors. Formats are standardized for film gauges now in commercial use. Films in the same format have the same gauge, width, image height and position, and perforation placement and size. Formats are also standardized for videotape by width, track placement, and other factors.

Frame Rectangular area of the motion picture film strip that holds a single film image. Sometimes used as a unit of measurement, e.g., frames per second.

Frame enlargement Still photograph that reproduces a single frame of motion picture film.

Full-coat mag Short for full-coat magnetic sound track. Production or preservation sound element in which the magnetic oxide recording layer covers one full side of the film surface.

Gate Mechanism in a camera, projector, or printer that holds the film strip.

Gauge Width of the motion picture film from edge to edge, expressed in millimeters.

Grading Process through which the laboratory technician determines the correct brightness and color of a film element scene by scene. Also known as timing.

Head Beginning of film roll.

Head out Film wound on a reel or core so that its beginning is on the outside.

Hygrometer Device for measuring relative humidity.

IMAP Independent Media Arts Preservation (www.imappreserve.org). Consortium affiliated with Electronic Arts Intermix that has developed a cataloging template to help repositories organize their media collections.

In-camera Any process or effect that is achieved within the camera itself during shooting rather than through manipulation at a later stage of production.

Inspection Close examination of film to identify technical characteristics and physical condition.

Intermediate Any film material created in the process of making a viewing print from original source material.

Internegative Color negative from which new prints can be created. In the preservation copying of color film, the new internegative may be made from an original print or from an interpositive.

Interpositive New duplicating positive created during the copying of color film. This intermediate preservation element is made from a negative original and is used to produce a color duplicate negative, called an internegative. Sometimes abbreviated as IP.

Intertitles In silent films, the screens of text containing dialogue and other information about the narrative or action.

IP Abbreviation for interpositive, the duplicating positive created during the preservation copying of color film.

IPI Image Permanence Institute (www.rit.edu/ipi). Research organization at the Rochester Institute of Technology that studies the effect of light, heat, pollutants, and humidity on imaging materials.

ISO International Organization for Standardization (www.iso.org). International group that develops manufacturing and performance standards for many industries.

Kinetoscope loop Piece of film used in a kinetoscope, the personal viewing machine publicly introduced by Thomas Edison and W.K.L. Dickson in 1893. Kinetoscopes used 35mm film, which remains the industry standard.

Kodachrome Color reversal motion picture film introduced by Kodak to the 16mm market in 1935. Available as slide and 8mm film in 1936.

Kodacolor Lenticular color motion picture film introduced by Kodak to the 16mm market in 1928. Term also used by Kodak for color still photographic film.

Leader Blank film attached to the beginning and end of film rolls to facilitate handling. Sometimes used to separate short films or shots on a single film roll.

Lenticular film Black-and-white film in which the base is embossed lengthwise with ridges that act as semicylindrical lenses. When lenticular film is shown through a three-color projector lens, it appears in color on the screen. See also Kodacolor.

Licensing Transfer of rights from the rights holder to another party generally for a specific use, duration, and territory.

Light box Illuminated box with glass or plastic surface used for examining film.

Liquid-gate printing Printing process during which motion picture film is briefly immersed in a chemical bath that helps to fill in scratches. Also known as wet-gate printing.

Loupe Magnifying eyepiece used in film identification.

Magnetic sound track Motion picture sound track in which the sound information is carried by magnetic oxide. Magnetic sound track can be affixed to a print as a stripe along the film edge or exist as a separate element (full-coat mag). Often shortened to magnetic track or mag track.

Magnetic stripe In a composite print, the stripe of magnetic oxide applied near the film edge to carry the sound record or affixed to the opposite edge for balance.

Magnetic track deterioration Decay of the sound track that results in sound loss due to shedding, sticking, or layer separation.

MARC Machine Readable Cataloging. International standard for bibliographic data adopted by the library community to facilitate electronic data sharing.

Married print Another term for composite print. Film positive carrying both picture and sound track.

Master In film preservation, the sound and picture elements that are sufficient for printing new film copies without reuse of the original source. Also known as preservation master.

MIC Moving Image Collections (gondolin.rutgers.edu/MIC/). Online entry point to moving image collections. The development of MIC is sponsored by the Association of Moving Image Archivists and the Library of Congress.

Molecular sieve Commercially available desiccant placed in a sealed film can to adsorb acetic acid vapor and moisture.

Mute Sound film element that carries only picture.

Negative Film carrying the reverse image of the motion picture subject. The negative is exposed in the camera or created from a positive in the laboratory. It is printed to produce a positive for projection and viewing.

Nitrate Short for cellulose nitrate. Transparent plastic used as the base in the earliest 35mm film stock. Highly flammable, nitrate base film was phased out by the early 1950s.

Nitrate decay Chemical degradation of cellulose nitrate plastic film base that is accelerated by high relative humidity and temperature.

OCLC Online Computer Library Center (www.oclc.org). Nonprofit membership organization hosting an online catalog system used by libraries around the world.

One-light print Film print produced with a single level of color and brightness for all scenes.

Optical printing Laboratory process in which the image is projected through a lens and copied onto raw stock, frame by frame. Often used to produce prints in a different format from the original.

Optical sound track Photographically printed sound record carried on the film print or produced as a separate element.

Original Film artifact that can be used as source material in duplication. Also used to describe film exposed in the camera.

Outtakes Footage not used in a completed film.

PAT Photographic Activity Test. Tool developed by the Image Permanence Institute to predict the chemical reaction between photographic materials and their enclosures.

Perforations Holes, usually along the film edge, used to advance the film strip through a camera, printer, or projector. Also known as sprocket holes.

Polyester Toughest and most chemically stable safety film base used today.

Positive Film that has a positive image of the motion picture subject. The positive is generally produced from a negative and used for viewing.

Preservation Continuum of activities necessary to protect film for the future and share its content with the public.

Preservation master Sound and picture elements that are sufficient for printing new film copies without reuse of the original source. Often shortened to master.

Presstape Adhesive splicing tape prepared in ready-cut segments.

Printer Machine used to duplicate motion picture film.

Printing Process of duplicating motion picture film.

Processing Range of laboratory procedures used to develop and fix the latent image in exposed motion picture film.

Projector Machine for displaying motion picture prints on a screen.

Public domain Term used to describe film or footage that is not protected by copyright and may be used without permission of the creator or former rights holder.

Quality control Process through which preservationists check the acceptability of preservation elements. Usually accomplished through review of the answer print.

Raw stock Unexposed film.

Redimensioning Chemical treatment that temporarily returns shrunken film to close to original dimensions for preservation copying. This process may result in permanent damage to the original and should be used only in extreme cases.

Reduction print Positive made in a smaller format than the original, such as a 16mm print made from a 35mm original.

Reel Metal or plastic hub with extended sides between which film is wound for projection. Also, for silent-era motion pictures, an imprecise measure of run time. Each 1,000-foot, 35mm reel runs between 10 and 18 minutes, depending on projection speed.

Reference print Positive film copy made for projection and public access.

Regular 8mm Term applied to 8mm film to distinguish it from Super 8mm.

Relative humidity Ratio of the amount of water actually in the air to the maximum air can hold at the same temperature. Abbreviated as RH.

Release print Print made for distribution.

Restoration Reconstruction of a specific version of a film.

Reversal original Film that is run through the camera and processed to produce a positive image. Positive reversal film has no corresponding negative.

Rewind Hand-cranked or motorized device used in pairs to control the winding of film for inspection and for transfer from reels to cores.

RH Relative humidity. Ratio of the amount of water actually in the air to the maximum that air can hold at that given temperature.

RLIN Research Libraries Information Network (www.rlg.org/rlin.html). Online system of the Research Libraries Group, the nonprofit group with more than 160 university, library, archive, and historical society members.

Safety film Term applied to all film made with a nonflammable plastic base.

Scratch Scrape or abrasion to either the base or the emulsion side of film.

Shot list Finding aid that describes the content of each film scene or segment.

Show print Positive created for film screenings. Also known as exhibition print.

Shrinkage Contraction of film from its original dimensions.

Shrinkage gauge Device used to measure the extent to which film has contracted from its original dimensions. Compares the standardized distance between perforations with that of the shrunken film and expresses the difference as a percentage.

Silent film Film made without a sound track. Also used to describe commercial motion pictures produced before the widespread adoption of the sound film in 1929.

16mm Film gauge introduced in 1923 for the nontheatrical market. Measures 16 millimeters in width.

Small gauge film Umbrella term generally applied to 8mm and Super 8mm film, although it can be applied to any film less than 35 millimeters in width.

SMPTE Society of Motion Picture and Television Engineers (www.smpte.org). International technical association that publishes standards, recommended practices, and engineering guidelines for film, television, video, and multimedia materials.

Sound restoration Process through which original aural qualities of the film sound track are reconstructed. In restoration the sound is generally transferred to digital files, where the sound damage—hiss, pops, clicks—can be removed.

Sound track. See Magnetic sound track and Optical sound track.

Splice Joining of two film pieces usually by cement, tape, or ultrasonic technology.

Splicer Piece of equipment for joining two pieces of film. Splicers come in many designs and may use cement, adhesive tape, or ultrasonic technology.

Splicing tape Adhesive tape for repairing film.

Split reel Reel with a removable side. Used to transfer film between reels and cores.

Sprocket Toothed mechanism that engages with film perforations to advance the film strip through a camera, printer, or projector.

Sprocket damage Tears, rips, and other physical damage to film perforations. Generally caused by improper projection.

Sprocket holes Holes, usually along the film edge, used to advance the film strip through a camera, printer, or projector. Also known as perforations.

Staging area Room set at a temperature and humidity level between that of the cold vault and the workroom. Film is acclimated in the staging area before it is moved to a new environment.

Stock General term for film. Applied particularly to unexposed film.

Super 8mm Film measuring 8 millimeters in width, with smaller sprocket holes than Regular 8mm film so that more area is left for the picture.

Tail End of film roll.

Tail out Film wound on a reel or core so that its end is on the outside of the roll.

Telecine Piece of laboratory equipment that converts film images and sound into digital or analog video images and sound.

Thermohygrometer Device for measuring temperature and relative humidity. Thermohygrometers that output data to graph form are called hygrothermographs.

35mm Standard film gauge for the theatrical film industry. Measures 35 millimeters in width.

Timed print Print in which the color and brightness are adjusted scene by scene.

Timing Process through which the laboratory technician determines the correct brightness and color of a film element scene by scene. Sometimes called grading.

Triacetate Short for cellulose triacetate. Strongest acetate film base.

Trial print Another term for answer print.

Ultrasonic cleaner Piece of laboratory equipment in which film is passed through a solvent bath where high frequency vibrations dislodge dirt.

Ultrasonic splicer Machine that splices polyester film by fusing the two film ends using high frequency energy.

U-matic videotape A format of three-quarter-inch analog videotape that is packaged in a cassette.

Union catalog Reference tool that brings together in a unified sequence information on the holdings of two or more repositories.

Vault Storage area for film.

VHS videotape A format of one-half-inch analog videotape that is packaged in a cassette.

Vinegar syndrome Popular term for acetate decay.

Wet-gate printing Printing process during which motion picture film is briefly immersed in a chemical bath that helps to fill in scratches. A wet gate can be incorporated into a film printer or a telecine. Also known as liquid-gate printing.

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www.aaslh.org

American Association of Museums (AAM)
www.aam-us.org

Association of Moving Image Archivists (AMIA)
www.amianet.org

Conservation OnLine: Resources for Conservation Professionals
palimpsest.stanford.edu

Eastman Kodak Company
www.kodak.com

Film Forever: The Home Film Preservation Guide
www.filmforever.org

Image Permanence Institute (IPI), Rochester Institute of Technology
www.rit.edu/ipi

Independent Media Arts Preservation (IMAP)
www.imappreserve.org

International Federation of Film Archives (FIAF)
www.fiafnet.org

Internet Archive: Movie Archive
www.archive.org/movies

Library of Congress
www.loc.gov

Moving Image Collections (MIC)
gondolin.rutgers.edu/MIC/

National Film Preservation Board (NFPB)
lcweb.loc.gov/film

National Film Preservation Foundation (NFPF)
www.filmpreservation.org

Online Computer Library Center (OCLC)
www.oclc.org

Research Libraries Information Network (RLIN), Research Libraries Group
www.rlg.org/rlin.html

ScreenSound Australia (National Screen and Sound Archive of Australia)
www.screensound.gov.au

U.S. Copyright Office
www.copyright.gov

Selected Listservs and Discussion Groups

Association of Moving Image Archivists (AMIA)
AMIA-L: An Online Forum for Moving Image Archivists
www.amianet.org/amial/amial.html

H-Net Humanities & Social Sciences Online
H-Film Discussion Group (cinema history and uses of media)
www.h-net.org/~film

Society of American Archivists (SAA)
Archives and Archivists Listserv
www.archivists.org/listservs/index.asp#archives-archivists

Visual Materials Section, Cataloging and Access Roundtable List
www.lib.lsu.edu/SAA/vmelist.html

INDEX

About the National Film Preservation Foundation

The National Film Preservation Foundation (NFPF) is the independent, nonprofit organization created by the U.S. Congress to save America's film heritage. Growing from a national planning effort led by the Library of Congress, the NFPF began operations in 1997, thanks to donations from the Academy of Motion Picture Arts and Sciences, The Film Foundation, and others in the entertainment community. The foundation works directly with archives to rescue endangered films that will not survive without public support.

The NFPF raises money, gives grants, and organizes cooperative projects that enable archives, libraries, museums, historical societies, and universities to work together to save American films not preserved by commercial interests. Since opening its doors, the NFPF has helped preserve more than 630 films and collections and assisted archives in 34 states and the District of Columbia.

The NFPF is a public charity incorporated in the District of Columbia and affiliated with the National Film Preservation Board of the Library of Congress. It depends entirely on private contributions to support operations.